

THE CRAB SPIDERS
OF CALIFORNIA
(ARANEIDA, THOMISIDAE)

ROBERT X. SCHICK

BULLETIN
OF THE
AMERICAN MUSEUM OF NATURAL HISTORY
VOLUME 129 : ARTICLE 1 NEW YORK : 1965

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BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Volume 129, article 1, pages 1-180, figures 1-262,
tables 1-6, maps 1-40

Issued March 8, 1965

Price: \$3.00 a copy

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INTRODUCTION

THE CRAB SPIDERS comprise the moderately large family Thomisidae, which is world wide in distribution. The common name "crab spiders" applied to the family refers to the crab-like appearance of the majority of species: the body is short and broad and the legs are oriented at right angles to the longitudinal axis. Most species are found on vegetation, but some occur on dead bark, on the ground, or in leaf detritus. Capture of prey is effected without the means of a web but rather by means of ambush or, less usually, by active pursuit. Gertsch (1939) has reviewed the somewhat limited information on the bionomics of the family.

The Thomisidae have attracted considerable attention in the past, but the majority of studies have been confined largely to descriptions of new species and regional surveys. The only world revision of the family is that of Simon (1895-1903). Knowledge of the Nearctic fauna is based principally on the works of Gertsch (1932-1953), which include revisions of the Thomisinae (or Misumeninae) and *Tibellus*. Some groups in *Philodromus* have been revised by Dondale (1961, 1963, MS).

Most of the present paper is devoted to descriptions of the Californian species and groups, but some of the work is revisionary. California is well endowed in the number of thomisid species; of the some 210 now known from North America north of Mexico, 95 occur in the state. Also covered in this paper are analyses of the morphology, as it pertains to the taxonomic treatment, and of the distribution from the standpoint of biotic provinces and of faunal elements.

The species interpretations are based principally on morphological criteria. However, possible mechanisms of reproductive isolation between some species of *Misumenops* are briefly discussed in the introduction to the subgenus *Misumenops*.

MATERIALS AND METHODS

The study is based on an examination of some 4000 specimens of adult crab spiders, chiefly from California but with a representa-

tion of species from the eastern United States, Central and South America, and the Palearctic Region. The only published records used are those in revisions of the groups. Much of the material was collected by myself, which has been deposited in the American Museum of Natural History, or was lent by the American Museum of Natural History and the California Academy of Sciences. Collecting trips were planned to include the biotic areas recognized by Miller (1951) and the non-maritime plant communities of Munz and Keck (1949, 1950). Collecting was done mainly by beating and sweeping vegetation.

Many of the species were taken in an immature stage and reared to maturity. These were routinely reared individually in 23 by 85-mm. shell vials. The standard meal was four flies every two to three days, *Drosophila melanogaster* for smaller spiders and the larger *D. hydei* for larger spiders. Most of the species of thomisids could be reared to maturity with success, some exceptions being *Xysticus knowltoni* and some species of *Thanatus*.

Many of the species undergo what I have termed "diapause." This occurs during a certain period of the year, in the fall or winter months for most species. During this period the spider accepts food only occasionally (a "maintenance diet") and does not undergo ecdysis even though the abdomen may be turgid. Often all or many individuals of a particular species that are being reared will molt to maturity within a period of one or two weeks after an extended diapause.

The laboratory matings attempted in this study involved both intraspecific and interspecific crosses. Mating was induced simply by introducing the male into the vial of the female. In the intraspecific crosses the males usually showed an immediate attraction to the female, sometimes initially manifested by a short period of "palpating" her web. Most progeny reared well on the *Drosophila* diet, and, in one case, an F₂ generation was obtained when the spiderlings were reared in a group container. (Cannibalism was kept to a minimum in group rearings by regular feedings and possibly by the providing of semi-

private "quarters," i.e., strips of paper toweling attached to the neck of the wide-mouthed jar.)

METHODS OF PRESENTATION

SYNONYMIES AND TAXONOMIC REFERENCES

An asterisk following the citation of a type specimen indicates that that specimen has been examined personally. Synonymies include only nominal genera and nominal species applied to forms from California and new synonymies. The phrase "synonymy disclaimed" indicates an original change. The only taxonomic references given are those of major revisions.

MORPHOLOGICAL DESCRIPTIONS

These are intended primarily to distinguish the Californian taxa from one another, but, when necessary, the new species are contrasted to non-Californian Nearctic forms. The terminology is explained in the section on Morphology.

All measurements are in millimeters and were made with an ocular micrometer on preserved specimens. Gross size measurements are based usually on 10 representative specimens to indicate the general trend only, and considerable departure from the average can be expected. The measurements of the male palpus are based on 20 or more specimens, whenever available; these measurements are more reliable.

Specimens that exhibit a marked departure from the norm and that may be of taxonomic significance are described separately as "deviates."

DISTRIBUTIONAL DATA

Individual collecting localities are shown on the distribution maps. Distribution by biotic province and district is indicated in table 3.

SEASONAL AND ECOLOGICAL DATA

These are based on Californian forms only, unless otherwise stated.

ILLUSTRATIONS

Each illustration is based mainly on one specimen (not necessarily the type), but modifications may have been made following the examination of other specimens.

DISTRIBUTION MAPS

The prototype for the distribution maps was prepared especially for this study from United States Coast Geodetic Survey 1:1,000,000 maps, with details from 1:500,000 maps. Each symbol for a species or form in general represents a separate collection of that form and for most localities the error in placement is probably less than 5 miles. The symbols for one form are circumscribed by a continuous line (except when the form shows a significant disjunct distribution), simply the better to visualize the distribution and to set it off from the distributions of other forms plotted on the same map. It does not necessarily reflect the suspected limits of distribution of that form. In some cases, in which only a county record is available, the circumscribing line is extended to include that county. The outlines for the biotic provinces and districts shown in maps 1 and 2 are based in part on the "Vegetation Types of California," a map published by the United States Department of Agriculture Forest Service, California Forest and Range Experiment Station, January 1, 1945.

ACKNOWLEDGMENTS

My deepest appreciation for invaluable aid in the present study goes especially to Dr. John N. Belkin, Dr. Willis J. Gertsch, and my wife Aiko. Dr. Belkin, under whose supervision my graduate work and preparation of the initial stages of this paper were carried out, stimulated an interest in arthropod chaetotaxy and in innumerable ways aided the completion of the project. Dr. Gertsch, without whose aid the scope of this work would have been greatly reduced, was a constant source of encouragement and guidance, read much of the manuscript, and spent a great amount of time sorting out material for my use. Aiko performed the often thankless and seemingly endless task of typing and correcting the many rough copies of the manuscript.

I am grateful to the following people for their critical appraisal of parts of the manuscript: Drs. Charles D. Dondale, Herbert Levi, Lawrence Swan, and James R. Sweeney. Dr. Dondale also spent considerable

time in presenting valuable data on *Philodromus* to me.

I would like to thank Dr. Willis J. Gertsch of the American Museum of Natural History, Dr. Herbert Levi of the Harvard Museum of Comparative Zoölogy, and Dr. Ralph V. Chamberlin of the University of Utah for the loan of type material under their care, and Dr. E. S. Ross and Mr. H. Leech of the California Academy of Sciences for permitting me to examine the Academy collection.

The following people were kind enough to collect crab spiders for me: Dr. Charles L. Hogue, Mr. William A. McDonald, Mr. William Nelson, Mr. Robert Parkins, Mr. Vincent D. Roth, Mr. Frank Sala, and, especially, Mr. David Verity.

This study was supported in part by a National Science Foundation Cooperative Graduate Fellowship and a University of California Patents Fund grant.

OUTLINE OF CLASSIFICATION

The following scheme of classification of the Californian Thomisidae to subgenus, adopted in the present paper, is included here for the convenience of the reader:

Subfamily Philodrominae

Tribe Philodromini

Philodromus Walckenaer

Subgenus *Philodromus* Walckenaer

Subgenus *Tibellomimus* Gertsch

Subgenus *Philodromoides* Scheffer

Rhysodromus, new genus

Subgenus *Rhysodromus*, new subgenus

Subgenus *Locupletus*, new subgenus

Ebo Keyserling

Subgenus *Titanebo* Gertsch

Subgenus *Ebo* Keyserling

Tribe Thanatini

Apollophanes O. Pickard-Cambridge

Subgenus *Horodromus* Chamberlin

Pellocranes, new genus

Thanatus C. L. Koch

Tibellus C. L. Koch

Subfamily Thomisinae

Diaea Thorell

Misumena Latreille

Misumenoides F. Pickard-Cambridge

Misumenops F. Pickard-Cambridge

Subgenus *Misumessus* Banks

Subgenus *Misumenops* F. Pickard-Cambridge

Tmarus Walckenaer

Xysticus C. L. Koch

Apophysate Division

Subgenus *Pellysticus*, new subgenus

Subgenus *Xysticus* C. L. Koch

Subgenus *Lassysticus*, new subgenus

Anapophysate Division

Subgenus *Proxysticus* Dalmas

Subgenus *Psammitis* Menge

Coriarachne Thorell

Ozyptila Simon

The order of listing of these taxa does not indicate a proposed phylogenetic sequence.

MORPHOLOGY

SOME OF THE CUTICULAR MORPHOLOGICAL features of the Thomisidae pertinent to the present study are discussed in the following account. Much of the terminology used is topological, since the morphology of spiders is still poorly understood and homologies with other groups of arthropods have not been clearly established. An asterisk (*) following a term denotes new terminology. For fuller reference to the terminologies of the male and female genitalia, see the excellent works of Comstock (1910) and Gering (1953).

CARAPACE

Figures 1, 2

TOPOGRAPHY

The carapace can be divided into three regions, the clypeus, disc*, and bilateral allata*.

The clypeus is the area that lies between the cephalic margin of the carapace and the AME (see Eyes, below), terminating laterally near the level of the PLE or farther cephalad.

The disc is a broad and elongate medial region that extends from the level of the AME caudad through the metadiscus (see below) and can be subdivided as follows: (1) prodiscus*, the anterior portion lying in the ocular area, (2) mesodiscus*, the intermediate and longest portion delineated cephalad by the PME, caudad by the metadiscus, and laterad by the cervical groove or, when the groove is not developed, by a narrow stripe passing through setae S1 and T1 (see below) or by a difference in coloration of the allatum, and (3) metadiscus*, the posterior portion developed as a usually distinct and white, V-shaped marking. The metadiscus in the Thomisinae often shows a characteristic modification in which there is a narrow posterior band extending laterad to seta A4.

The allatum, bilaterally developed, is the area lateral and caudal to the discus. It may be unpigmented, uniformly pigmented, mottled, or have a lateral or mesial pigmented stripe, the allatal stripe. Often the allatal stripe is narrower cephalad than caudad, and in such cases the width of the stripe near its midline is used as the parameter for the width. The posterior portion of the allatum is in many cases sharply inclined caudad to

form the posterior declivity, best developed in some Thomisinae.

The width of the pars cephalica is indicated by the pars cephalica width index, which is the distance between the PLE multiplied by 10 and divided by the width of the carapace.

EYES

Nearctic Thomisidae have eight eyes arranged in two transverse rows of four eyes each, an anterior row and a posterior row. The eyes are notated in pairs: anterior median eyes (AME), anterior lateral eyes (ALE), posterior median eyes (PME), and posterior lateral eyes (PLE). When the lateral eyes of a row are situated caudal to the level of the median eyes that row is termed "recurved," and when the lateral eyes are situated cephalic to the level of the median eyes, "procurved."

Two eye indices have been found to be valuable in the describing of group and specific characters: (1) the PME interdistance index, which is the distance between the PME divided by the distance between the PLE and the PME, and (2) the PE recurvature index, which is the distance (in terms of PME diameters) between the anterior margins of the PME and PLE divided by the diameter of the PME.

CARAPACE CHAETOTAXY

Some carapace setae are constant in position and occurrence in certain groups, or throughout the family. These setae are termed "primary." Other setae, more variable in their occurrence, are termed "secondary." The distinction between primary and secondary setae is not absolute, and some subjectivity is involved. Thirty primary setae can be recognized, most of which are bilaterally paired.

The primary carapace setae are indicated by a capital letter (corresponding to the area where the seta is situated) and a number (denoting the particular seta of that area). There are eight primary setae on the clypeus (C1-8*), four on the prodiscus (Pl-4*), seven on the mesodiscus (S1-7*), six on the metadis-

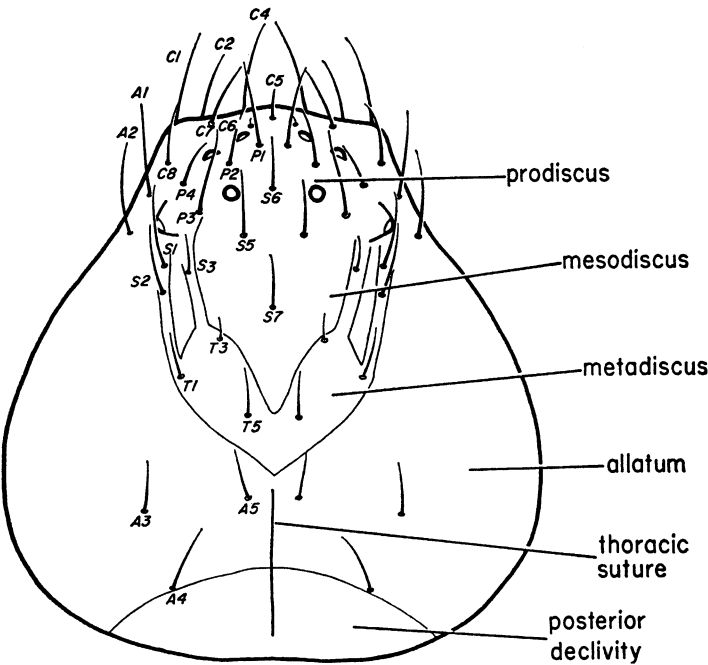


FIG. 1. Carapace of *Philodromus*, dorsal view.

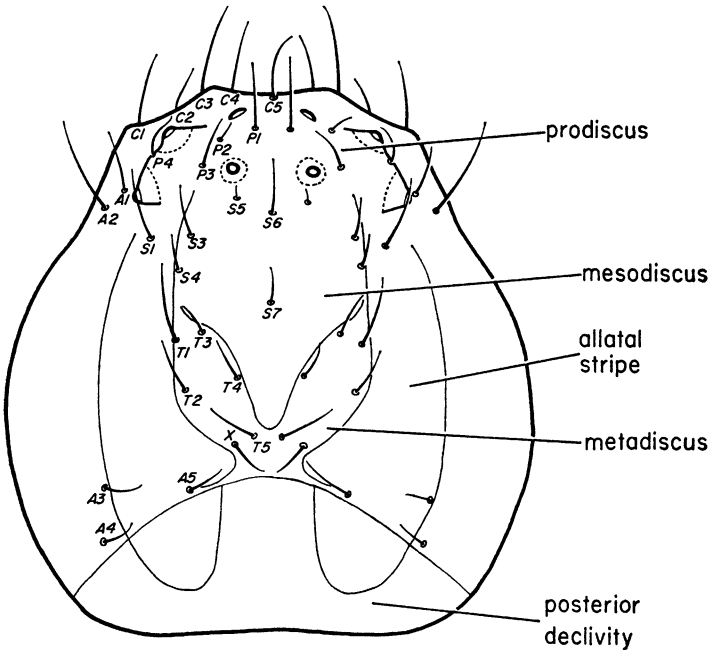


FIG. 2. Carapace of *Xysticus*, dorsal view.

cus (T1-5* and the X-seta*), and five on the allatum (A1-5*). Some of these setae are arranged in characteristic configurations, and for convenience these groups of setae are given names. C1-4, the frontal setae*, comprise the frontal row*. A3-5 comprise the caudoallatal setae*.

While homologies of the primary setae are presented in an authoritative manner in this paper (as indicated by the one system of nomenclature used for the entire family), it cannot be denied that there are problems in interpretation.

The carapace setae are sufficiently variable in length, form, position, and (applying more to secondary setae) occurrence to necessitate a cautious approach to their use as specific diagnostic characters. However, the carapace chaetotaxy often affords good group characters, e.g., generic characters in the Thomisinae. A carapace chaetotaxy similar to that of the Philodrominae is developed in the clubionoid families Gnaphosidae, Clubionidae, and Heteropidae, although the setae are usually not so clearly defined. Even in the Hypochilidae, the clypeal and prodiscal primaries can apparently be homologized with thomisid elements.

No attempt was made, for the present paper, to measure the length of the setae accurately; the variability renders such a time-consuming process inadvisable. Instead, the length is roughly estimated by comparison to the distance between the PME or the diameter of one of the eyes from a dorsal aspect (thus ignoring the vertical component). A seta that is stout and spinelike is termed a "spiniform."

LEGS

Three types of leg characters are used in this paper for taxonomic purposes: leg length, spiniform development, and the claw tuft. Worthy of further study is setal vestiture, especially of the telotarsus (= tarsus); at least nine distinct types of telotarsal setae were noted in the Thomisidae in the present study.

LEG LENGTH

This is indicated by the femur II length index*, which is the length of femur II (measured along the dorsal surface) divided by the width of the carapace.

LEG SPINIFORMATION

Figure 5

A prolateral row and a proventral row of spiniforms are present on tibia I and basitarsus I. The number and position of spiniforms can be represented by a formula, as follows: cited are (1) the number of spiniforms of the prolateral row, exclusive of the apical spiniforms; (2) in parentheses, the number of intermediate spiniforms, if any, between the prolateral and proventral rows; (3) the number of proventral spiniforms, again exclusive of the apical spiniforms; and (4) the number of apical spiniforms of the segment (for convenience a spiniform narrowly subapical is considered as apical). As an illustration, the apparently primitive thomisid spiniformation formulas are 3-3-1 for the tibiae and 2-2-2 for the basitarsi (fig. 5). The leg spiniformation is subject to considerable variation, especially in the Thomisinae.

CLAW TUFTS

The claw tuft is a group of setae at the tip of the telotarsus specialized for clinging. The claw tuft of the Philodrominae comprises a dense mass of tenent setae (setae dilated at the apex). Usually, in this subfamily, the tenent setae also form an equally dense, brushlike mass on the plantar surface of the telotarsus (and in some cases on the basitarsus). A segment with such a vestiture is termed "scopulate." In the Thomisinae the claw tuft is composed of various types of relatively sparse pectinate setae, and tenent setae are not developed. In some thomisines (e.g., *Diaea*, some species of *Xysticus*), the pectinate setae are relatively numerous, and the claw tuft may be superficially philodromine in appearance.

ABDOMINAL MARKINGS

Some of the thomisid abdominal markings are named and defined below. The terminology is intended solely for descriptive purposes, and homologies are not necessarily implied. It should be pointed out that in this paper the term "stripe" refers to a longitudinal marking and the term "band" to a transverse marking.

CARDIAC MARK

This is a narrow, anterior, middorsal, pigmented area, caudally acuate.

PARAMEDIAL STRIPE

This is a bilaterally paired and in most cases irregular dorsal stripe which is situated between the middorsal line and the dorsolateral margin of the abdomen, in some instances developed only in the posterior half of the abdomen.

PARAMEDIAL MACULAE

These are a longitudinal series of bilaterally paired, dorsolateral, pigmented areas, in some cases developed in the paramedial stripe.

LATERAL STRIPE

This is a bilaterally paired and usually irregular dorsolateral or lateral stripe.

VENTRAL STRIPE

This midventral stripe extends from the epigastric furrow (the deep suture caudal to the book lungs) caudad to the fore spinnerets, variously reduced, and in some cases represented by a macula.

MALE GENITALIA

Figures 3, 4

The term "male genitalia" in spiders is usually used in reference to the palpus, which is the intromittent organ. The primary reproductive opening, the gonopore, is situated in the epigastric furrow. The mature male spider spins a small sheet of web, the sperm web, upon which it deposits a drop of semen, passed out through the gonopore. The genital bulb, contained in the distal end of the palpus, is a complexly developed but essentially a hollow, bulblike structure. It is placed in contact with the semen, and the fluid passes into the hollow internal part (the receptaculum seminis) to be stored until copulation. In copulation the tip of the genital bulb is inserted into the female genital orifice, and the semen is ejected.

The palpus consists of seven segments (coxa, trochanter, femur, patella, tibia, tarsus, and pretarsus), but only the three terminal segments (also rarely the fourth, the patella) are modified to perform in copulation. There is a progressive increase in specialization distally in these three or four segments, the pretarsus being the most specialized.

PATELLA

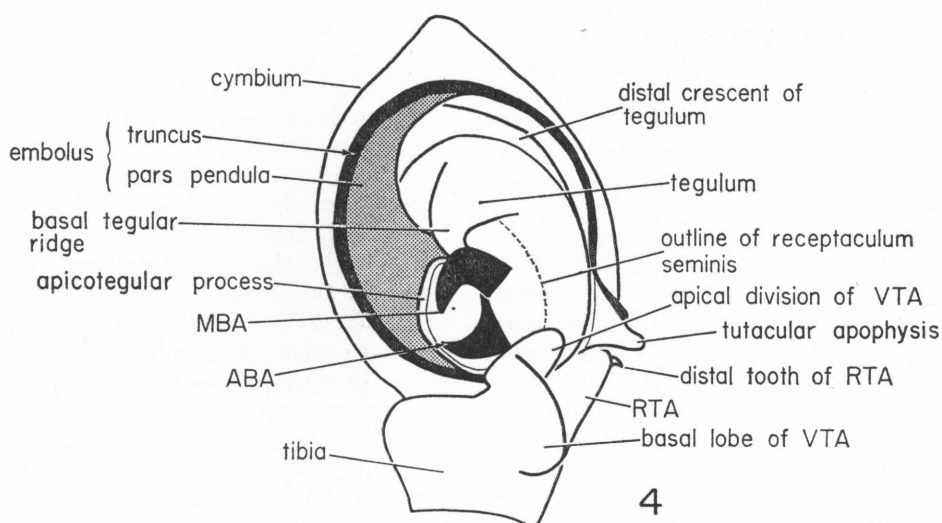
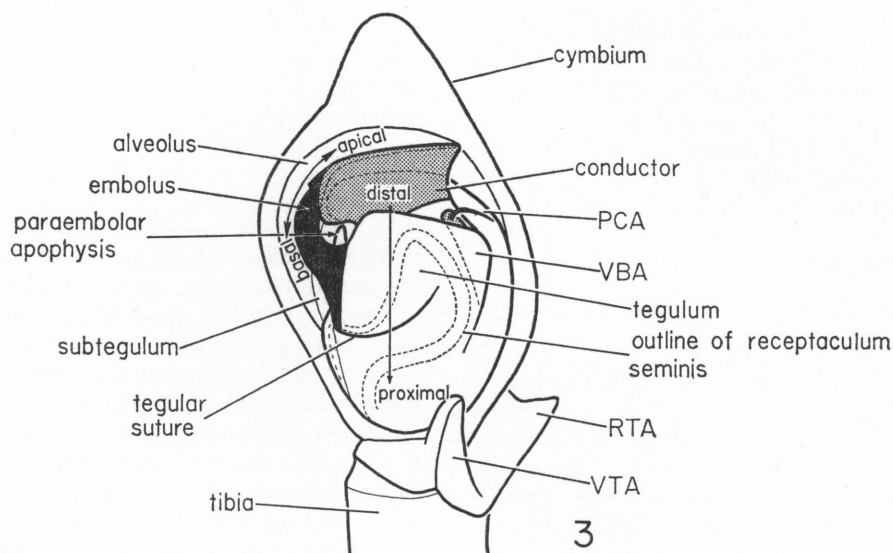
This segment is apparently specialized only in the subgenus *Locupletus*, in which it is relatively stouter than that in other thomisids and usually bears a retrolateral apical apophysis.

TIBIA

The principal specialization of the tibia is the development of apical apophyses. Also, in some groups of the Philodrominae and in all Nearctic Thomisinae, the segment, which is assumed to have been elongate primitively, has become broader than long. The length of the tibia is expressed as the tibial length index*, which is the length of the tibia divided by the length of the cymbium multiplied by 10.

There are usually two retrolateral apical apophyses on the tibia, one more retrolateral and dorsal in position, the retrolateral tibial apophysis (RTA), and the other more mesial and ventral in position, the ventral tibial apophysis (VTA). It seems likely that the RTA of the Philodrominae and Thomisinae are homologous, but homology of the VTA of these two subfamilies or even of groups in the subfamilies is not certain. The apex of the RTA is usually heavily sclerotized and translucent, forming the distal tooth. In some cases the distal tooth is broad and produced to form a ventral tooth and a dorsal tooth (fig. 18, vt, dt). The RTA in the subgenus *Misumenops* serves to orient and anchor the palpus during copulation by insertion beneath the hood of the epigynum. Dondale (*in litt.*) has observed that in species of *Philodromus* the RTA is "simply rammed against the integument of the female venter, either in front of the epigynum or behind it, and friction holds it firm while the bulb rotates." The VTA in the subgenus *Misumenops*, and possibly in all species with a circumtegular ridge (see below), serves as a guide for the rotating bulb by engaging with the circumtegular ridge. In some species of *Philodromus* and in most of the Thomisinae a third apical apophysis, the intermediate tibial apophysis (ITA), is developed between the VTA and RTA.

The three tibial apophyses (RTA, VTA, and ITA) are present in most Thomisinae. The ITA is seldom an independent structure, being conjoined with either the VTA (*Tmarus*, most species of *Xysticus*, some of *Ozypt-*



FIGS. 3, 4. Male palpi, ventral view. 3. *Philodromus pinyonensis*, new species. 4. *Xysticus gosiutus* Gertsch.

Abbreviations: ABA, MBA, PCA, RTA, VBA, and VTA are standard abbreviations in the text.

tila) or the RTA (*Diaea*, *Misumenoides*, *Misumena*, *Misumenops*). However, homologies of the ITA between the different genera (or of groups within *Xysticus*) are uncertain.

CYMBIUM

The cymbium is the tarsal segment of the

palpus specialized for the reception of the genital bulb. There are several structural modifications of the cymbium for this purpose.

ALVEOLUS: This is a ventral depression which receives the basal and middle divisions of the genital bulb. Although usually described as a cuplike depression, the alveolus is

actually a ringed depression to the inner margin of which is joined the basal hematodocha (the membranous basal portion of the genital bulb).

TUTACULUM: This structure, which functionally supplants the conductor, is present in the Thomisinae only. Usually it is formed as a shallow, membranous, tutacular groove developed peripherally along the distal, and usually also the retrolateral, margins of the alveolus. The groove is broadened in those species with a spiralliform embolus, especially in *Misumenops* in which the tutaculum (in a broad sense) may be developed as a broad and round but shallow excavation on the retrolateral side of the cymbium. The apical portion of the embolus lies in the groove when the genital bulb is not extended in copulation. In many of the Thomisinae (e.g., *Tmarus*, *Xysticus*) a tutacular apophysis is also developed (fig. 4). This is a retrolateral structure which is formed ventrally as a smooth and setaless sclerotized outgrowth of the alveolus and dorsally as a setaceous extension of the dorsum of the cymbium. In genera exclusive of *Xysticus* the tutacular groove does not reach the tutacular apophysis, but in most species of *Xysticus* the groove extends into the apophysis as a deep channel.

GENITAL BULB

The genital bulb, or simply the bulb, is the terminal segment of the palpus homologous to the pretarsus (Barrows, 1925). It is a hollow organ, with external elaborations. The various divisions and subdivisions of the external parts are listed below, with the corresponding subdivisions of the spiralliform internal canal, the receptaculum seminis (after Comstock, 1910):

EXTERNAL PARTS	RECEPTACULUM SEMINIS
Basal division	
Basal hematodocha	—
Subtegulum	Fundus
Middle division	
Middle hematodocha	Fundus
Tegulum	Reservoir
Apical division	
Embolus	Ejaculatory duct

The subtegulum, tegulum, and embolus are hollow sclerites, and the hematodochae are spirally twisted membranous sleeves. The

basal hematodocha connects the cymbium and subtegulum, and the middle hematodocha connects the subtegulum and tegulum. It should be noted that a hematodocha does not join the tegulum and embolus, these two sclerites being immovably joined. In *Misumenops*, however, a small membranous area joins these two sclerites. During coitus the hematodochae distend with hemolymph, forcing a revolution of the tegulum (which may bear orienting structures which engage with guide structures surrounding the female orifice) and the embolus into the bursa copulatrix of the female.

The spiral course of the receptaculum seminis through the genital bulb and the similar orientation of some of the bulbal parts necessitate the use of both morphological and topological terminologies in the descriptions. The terms "basal" and "apical" are restricted to directions along the morphological longitudinal axis, and the terms "proximal," "distal," "prolateral," and "retrolateral" to directions along the topological axis (see fig. 3). The length of the bulb is determined by measurement along the ventral surface, from the proximal margin of the tegulum to the most distal part of the embolus.

BASAL DIVISION: The basal hematodocha is sclerotized basally to form a somewhat triangular sclerite, the petiole, the base of which articulates or is partially fused with the inner margin of the alveolus. The subtegulum is a comma-shaped sclerite of which the bulbous apical end articulates with the tegulum (the middle hematodocha connects these two sclerites submarginally). In the Philodrominae this part of the subtegulum is often visible in the unexpanded bulb projecting from between the cymbium and the tegulum at the prolateral or proximal side of the bulb (fig. 89, s).

MIDDLE DIVISION: The tegulum, a discoidal sclerite, is the main portion of the middle division. The tegulum may bear apophyses (some of which apparently aid in orienting the bulb with epigynal structures during coitus), a conductor, or other structures; these various elaborations are discussed below. Points at the circumference of the tegulum are indicated as degrees of a circle in intervals of 45 degrees (although the tegulum is seldom perfectly circular).

APOPHYSES OF TEGULUM, PHILODROMINAE: Some of the philodromine apophyses are given formal names below, thus implying homology. While such intimation is intentional, it should be pointed out that the homologies are speculative.

The only apophysis that appears to be present generally throughout the subfamily is the ventral bulbar apophysis* (VBA). The VBA is developed on an area of the tegulum near the apex of the middle loop of the reservoir (discussed below). In the Philodromini the VBA is apparent only in the subgenera *Philodromus* and *Tibellomimus* in which it is developed as a usually evenly margined retrolateral plate. The VBA in the Thanatini is usually a short, distally projecting, truncate structure, often serrated at the tip (fig. 116).

The paraconductor bulbar apophysis* (PCA) is a usually strongly produced and heavily sclerotized apophysis originating in a membranous area near the retrolateral edge of the conductor in the genera *Philodromus* and *Rhysodromus*. The PCA is clawlike in the subgenera *Philodromus*, *Tibellomimus*, and *Locupletus*, slender in the former two and stout in the latter. In *Tibellomimus* and *Locupletus* the PCA is basally expanded to form a flat sclerite. The seta-like form of the PCA in the subgenus *Philodromus* led Dondale (1961) to refer to this structure as a "sensory seta." The PCA of the subgenus *Rhysodromus* is an arcuate and ectally irregularly toothed structure (fig. 81), a strong tooth being developed at the proximal end and in some cases near the middle.

The paraembolar apophysis* is a generally elongate and somewhat stout apophysis originating near the dorsal base of the embolus and paralleling this structure. The paraembolar apophysis is present in some species of the subgenus *Philodromus* and in all of *Tibellomimus* (see fig. 3).

Other tegular apophyses characteristic of the subgenera *Philodromus* and *Philodromoides* are described under those groups.

APOPHYSES OF TEGULUM, THOMISINAE: Three types of apophyses are developed in this subfamily: the tegular ridge*, the bulbar apophysis, and the apicotegular process*. Homologies of the apophyses in the Thomisinae are more certain than in the Philodrominae.

The tegular ridge is a usually low and

morphologically longitudinal structure. One of two types is developed in all genera: a circumtegular ridge* (*Diaea*, *Misumenoides*, *Misumena*, *Misumenops*, *Tmarus*) or a basal tegular ridge* (*Xysticus*, *Ozyptila*). The circumtegular ridge is a sharply edged and usually low structure ectally encircling the tegulum. This ridge is particularly well developed in *Misumenoides formosipes*, in which it forms a prominent but thin retrolateral apophysis (fig. 147, cr). The basal tegular ridge, in contrast, is broader, its surface plane to rounded, and is limited to the basal (central) portion of the tegulum (fig. 4).

The term "bulbar apophysis" in the Thomisinae is restricted in this paper to certain usually cylindrical and strongly produced apophyses in *Xysticus*. The apicotegular process, also found in *Xysticus*, is quite variable in structure. The bulbar apophyses and the apicotegular process are discussed in the introduction to *Xysticus*.

TEGULAR SUTURE*: This is a radial suture situated between the arms of the middle loop of the reservoir and is present only in the Philodrominae.

APICAL DIVISION: The conductor and the embolic subdivision comprise the apical division of the bulb (Comstock, 1910). The conductor, a distal membranous or sclerotized outgrowth of the tegulum which accommodates the apical portion of the embolus, is present only in the Philodrominae.

The conductor of the Philodromini is more variable than that of the Thanatini. In the Philodromini it may be developed as a prominent membranous lobe (subgenus *Philodromus*); a broad sclerite bearing a membranous groove, the membranous portion in some cases produced prominently retrolaterad (subgenus *Tibellomimus*); a stout sclerotized apophysis (subgenus *Philodromoides*); a lobe-like process, ventrally sclerotized and bearing a shallow membranous groove, the sclerite in the subgenus *Rhysodromus* appearing to articulate with the tegulum (*Rhysodromus*); or a retrolateral shallow groove the length of which is correlated with that of the embolus (*Ebo*). The length of the conductor groove in *Ebo* is expressed as the conductor length index, which is the length of the conductor divided by the length of the tegulum multiplied by 10.

The conductor of the Thanatini is a large,

distal, membranous lobe. In some of the species the conductor appears to have been shrunk back into the tegulum, possibly owing to the method of preservation or to the age of the individual.

The embolic subdivision consists solely of the embolus in the Thomisidae. The embolus is the actual intromittent part of the genital bulb. The embolus of the Philodrominae is usually a simple spinelike prominence the base of which is not always distinctly delimited from the tegulum (the connate type of Comstock). In some philodromines the embolus is cylindrical; in others it is flattened. The embolus of *Ebo* is characteristically arched basally (fig. 93, ae). In some species of *Tibellus* the embolus is situated upon the produced apex of the tegulum which is as strongly sclerotized; the embolus and produced portion of the tegulum are termed the "teguloembolar unit*."

The embolus of the Thomisinae typically comprises an ectal tubular sclerotized truncus and a mesial membranous pars pendula. In many of the Thomisinae the pars pendula tapers apicad, is shorter than the truncus, and is only weakly sclerotized apically. This type of embolus may be termed the "generalized type*" and is structurally similar to the spiral embolus of Comstock, but does not articulate with the middle division. Designation of the point of termination of the pars pendula in the taxonomic descriptions refers to the point of termination of the membranous portion (expressed as degrees of the adjacent part of the tegulum, e.g., 0 degrees in fig. 4).

Several characteristic modifications of the generalized type of embolus occur in the Thomisinae: 1. In *Misumenops* the embolus comprises a basal division and an apical division (figs. 158, 160). The basal division is a bulbous sclerite that articulates with the tegulum. The apical division comprises a truncus and pars pendula and is similar in structure to the generalized type of embolus. 2. In *Misumenoides*, *Misumena*, and the subgenera *Psammittis* and *Coriarachne* of *Xysticus*, the apical portions of the truncus and pars pendula form a common tubular sclerite, the apical embolar sclerite*, at the tip of which opens the ejaculatory duct (figs. 147, 152, 247). Basal to the sclerite, the ribbon-like free portion of the truncus, not visible

ventrally, is situated in a membranous pars pendula. The apical embolar sclerite of *Misumenoides*, *Misumena*, and *Xysticus* undoubtedly represent convergence. 3. In *Tmarus* and the subgenus *Xysticus* the pars pendula is broadly developed along its entire length and further is expanded apically to form a mesoventral fold. The fold is variously sclerotized to form a pendular sclerite* (figs. 199, 227, 228, ps). The pendular sclerite, in contrast to the apical embolar sclerite, does not contain the orifice of the ejaculatory duct.

RECAPTACULUM SEMINIS: The receptaculum seminis is first apparent as a seemingly blind and heavily sclerotized canal in the bulbous apical portion of the subtegulum. This part of the canal shows no obvious taenidia and would thus appear to be part of the fundus, although the walls are heavily sclerotized. Just basally, in the subtegulum, is a thick-walled chamber in which possibly a more delicately walled fundus is situated. The receptaculum seminis continues from the subtegulum through the middle hematochoa as a heavily sclerotized canal and into the tegulum as the reservoir. The reservoir follows a spiral course through the tegulum and is usually visible through the tegular integument. The reservoir forms three loops in the Philodrominae, a basal, middle, and apical loop; the apical loop gradually tapers apicad to form the ejaculatory duct in the embolus. In the Thomisinae the reservoir follows a circular peripheral course through the tegulum. The diameter of the canal is relatively greater than in the Philodrominae, and the canal tapers more abruptly, so that the reservoir and ejaculatory duct are usually distinctly delimited. The ejaculatory duct courses through the truncus and in some cases basally through the pars pendula.

FEMALE GENITALIA

The term "female genitalia" refers to both an external epigynum and a pair of longitudinal internal canals which are invaginations of the epigynal integument. The epigynum is a poorly to well-defined, median, sclerotized area developed about the intromittent orifices on the venter of the abdomen cephalad of the epigastric furrow and may bear structures of which some, at least, serve to orient the male palpus during copulation. Each internal canal is divided into an anterior receptaculum,

a term employed by Jaervi (Gering, 1953), and a posterior fertilization tube (the term "internal epigynum" may be used to refer to both of these structures together). The anterior end of the internal epigynum opens into the epigynum as the intromittent orifice (Snodgrass, 1952), and the posterior end, into the vagina (Comstock, 1910).

EPIGYNUM

Figures 6, 7

Several types of structure perhaps serve as guides for the male palpus. The guide pocket* is a concavity overlain by a sclerotized plate,

the hood; the guide pocket may be anterio-medial on the epigynum and unpaired or bilaterally paired. The median septum is any raised mediolongitudinal structure; cephalad the rim of the septum may curve laterad, forming the arch of the median septum. In some cases a basin-like depression, the atrium, is formed in the epigynum, and the surrounding rim may serve as a palpal guide. Often the median septum divides the epigynum into bilateral atria.

The receptacula are joined to the underlying epigynal integument by the spermathecal apodeme* (which indicates the invaginated

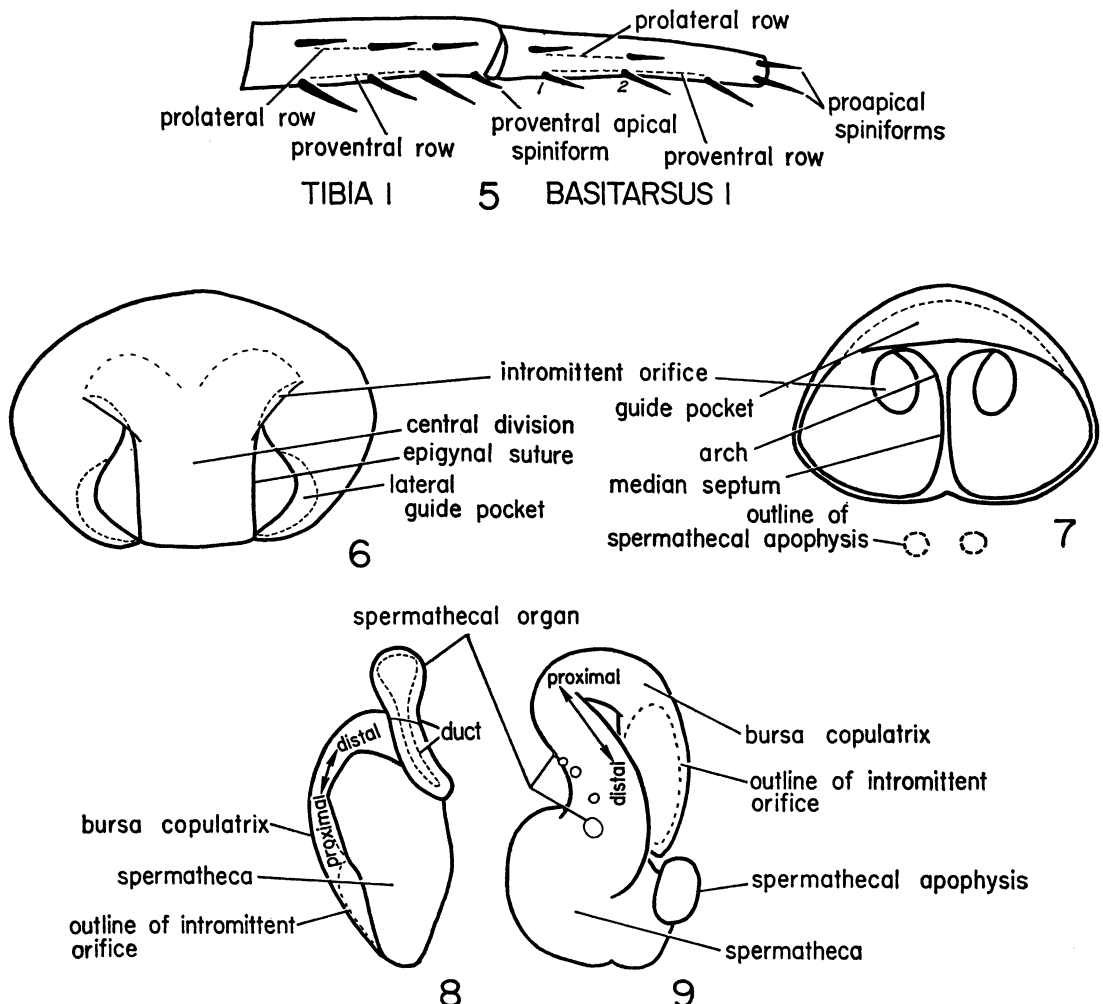
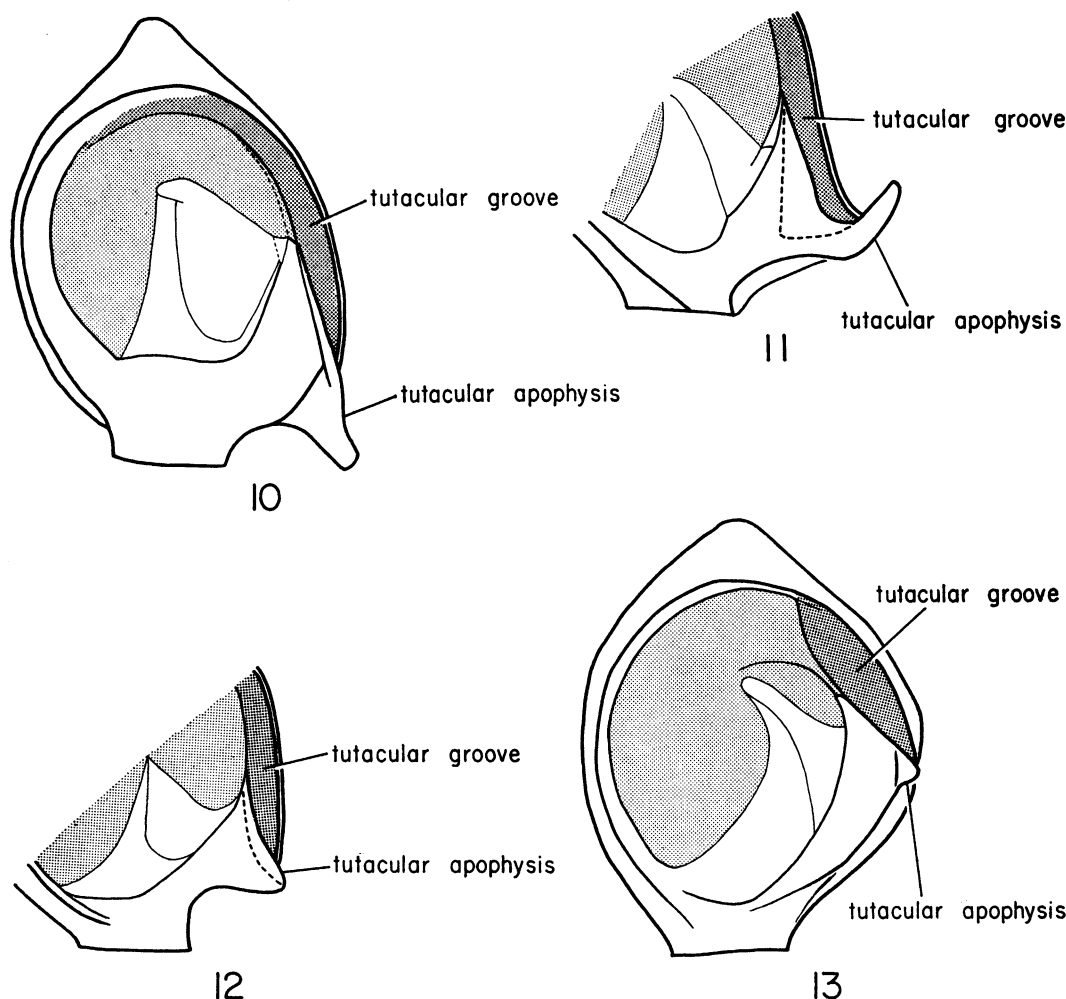


FIG. 5. Tibia I and basitarsus I of the Thomisidae, prolateral view.

FIGS. 6, 7. Epigyna. 6. *Thanatus altimontis* Gertsch. 7. *Misumenops californicus* (Banks).

FIGS. 8, 9. Receptacula, dorsal views. 8. *Apollophanes texana* Banks. 9. *Xysticus locuples* Keyserling.



FIGS. 10-13. Cymbia of *Xysticus*, ventral views, showing different types of tutacula. 10. *locuples* type. 11. *californicus* type. 12. *montanensis* type. 13. *utahensis* type.

nature of the receptacula). The spermathecal apodeme of the Philodrominae is developed along most of the length of the receptaculum and is externally indicated by the epigynal suture*. The area of the epigynum between the sutures is termed the "central division*." The spermathecal apodeme of the Thomisinae is a posterior, apophysis-like, cylindrical structure developed at the juncture between the spermatheca and the fertilization tube (see below). This apodeme is relatively more elongate dorsoventrally than that of the Philodrominae and is externally visible as a usually rounded dark body in the posterior portion of the epigynum. The homologue of the epigynal suture in the Thomisinae is a

shallow, wrinkle-walled pit.

RECEPTACULUM

Figures 8, 9

The receptaculum is usually subdivided transversely into a morphologically anterior intromittent division* and a posterior spermatheca. These are functional subdivisions and may not be homologous in the different groups. In relation to the designation of directions along the axis of the receptaculum the term "proximal" refers to a direction toward the intromittent orifice, and the term "distal," to the direction toward the fertilization canal orifice.

In most Thomisidae the intromittent di-

vision is developed as a simple, tubular, membranous canal, the bursa copulatrix, but in *Ebo* and *Misumenops* the intromittent division is more complex, including apparently non-copulatory parts. Generally, the length of the bursa copulatrix is correlated with the length of the embolus of the male. However, a curious situation exists in the *Philodromus speciosus* and *P. rufus* series of the subgenus *Tibellomimus*. The embolus of the male palpus in the *speciosus* series is usually shorter than that of the *rufus* series, but in certain extreme species in both series the reverse obtains. Nevertheless a quite elongate bursa copulatrix is invariably present in the *rufus* series, while a bursa copulatrix is apparently invariably lacking in the *speciosus* series.

An interesting modification of the intromittent division occurs in *Misumenops* (fig. 187). The intromittent division of this group is transversely subdivided to form a proximal, tubular, membranous bursa copulatrix (mbc) and a sclerotized, distal, flattened portion which is further subdivided into two longitudinal canals: a dorsal sclerotized bursa copulatrix (sbc) and a ventral canal (vc). The membranous and sclerotized bursae copulatrices form the actual intromittent canal. The function of the ventral canal is unknown.

The spermatheca is an expanded and heavily sclerotized part of the receptaculum. The inner wall often is produced to form elaborate processes, which deserve further study.

The spermathecae of species in the *Xysticus pallax* series form a morphological series which suggests an evolutionary sequence. In *Xysticus gulosus* (fig. 205) the receptaculum is not structurally subdivided into a bursa copulatrix and spermatheca, being more or less uniform in diameter throughout: distally, however, the receptaculum is tightly and characteristically convoluted. A spermatheca is obvious in *X. locuples* (fig. 208). Of great interest is the fact that its lumen forms a convoluted canal identical in form to the distal convoluted canal of *gulosus*. In *X. pretiosus* (fig. 215) the spermatheca is rather expansive but thin-walled. Internally there

are present shelves which appear to have been derived from a *locuples*-like condition in which the walls that separate the convoluted canal have partially disappeared. A chamber-like spermatheca thus might not be due simply to the inflation of a receptacular tube.

The cuticle of the spermatheca is often thickened and produced as a wartlike tubercle on the hemocoelic surface, the torus*.

The integument of the receptaculum in all of the Thomisidae is invaginated into the hemocoel that forms a single or multiple tubercle or a saclike process. The cuticle of these processes is pierced by minute canaliculi, and the overlying epidermis is quite thick and apparently glandular. Although Comstock (1910) proposed the name "glands of the spermatheca" for this part of the receptaculum, I use the term "spermathecal organ*" to avoid the awkwardness of referring to the prominent cuticular portion of the organ as a gland.

The spermathecal organ, when tubercle-like, can be confused with the torus. However, the spermathecal organ can always be distinguished under the compound microscope by the presence of the canaliculi with their pinkish orifices.

An elongate duct connects a saclike spermathecal organ to the spermatheca in many of the Philodrominae. The "blind tube" of *Agelena naevia* may be homologous to the canal and spermathecal organ of these philodromines.

The function of the spermathecal organ may be to provide nourishment for stored sperm, but Bhatnagar and Rempel (1962) suggest that its secretions may function to increase the hydrostatic pressure in the spermatheca and force the spermatozoa through the fertilization tubes.

The fertilization tube (or fertilization canal) is a relatively minute, distally tapering structure which is easily broken off the main body of the receptaculum during dissection. The fertilization tube is apparently of little taxonomic value in the Thomisidae.

ANALYSIS OF THE DISTRIBUTION

THE RICHNESS IN SPECIES of the Californian thomisid fauna is a reflection of invasions of several extraneous elements as well as the differentiation of endemic elements. As a consequence of these events, certain more or less distinct zoogeographic patterns have resulted which can be interpreted in terms of biotic provinces.

This section treats the biotic provinces and thomisid elements of California. The data on which inferences are made are present-day distributional records. These are based primarily on Californian material personally collected or lent by the American Museum of Natural History or the California Academy of Sciences. Records from outside the state are based largely on Dondale (1961, MS) and Gertsch (1933a, 1939, 1953). Unfortunately the result is an only fragmentary picture of the extra-Californian thomisid fauna, particularly in the western United States and Mexico which are important regions for our obtaining an understanding of Californian zoogeography. The scheme and composition of faunal elements presented here must thus be considered in this light.

The term "primary center of distribution" is used in this paper to denote an area that apparently represents either the center of origin or the oldest existing center of radiation of a group (any supraspecific taxon) or of a species.

PRIMARY CENTERS OF DISTRIBUTION OF GROUPS

Two criteria were used in the present study to indicate the primary centers of distribution of thomisid groups: (1) the area that represents the center from which dispersion routes appear to radiate, and (2) the area in which there is the greatest number of species of the group. These centers are cited only generally as boreal or austral, even though there are undoubtedly several distinct centers within each of these broad areas. The boreal centers are assumed to lie either in the coniferous forests of the Nearctic Region or in the Palearctic Region; the austral centers, in the New World south of or below the Nearctic coniferous forests.

The suggested primary centers of distribution of the thomisid groups of California are listed in table 1.

TABLE 1
SUGGESTED PRIMARY CENTERS OF DISTRIBUTION
OF THE THOMISID GROUPS OF CALIFORNIA

Group	Primary Center of Distribution
<i>Philodromus</i> (<i>Philodromus</i>)	Boreal
<i>Philodromus</i> (<i>Tibellomimus</i>)	Boreal
<i>Philodromus</i> (<i>Philodromoides</i>)	Austral
<i>Rhysodromus</i>	Boreal
<i>Ebo</i>	Austral
<i>Apollophanes</i>	Austral
<i>Pellocanes</i>	Boreal
<i>Thanatus peninsulanus</i> group	Austral
<i>Thanatus striatus</i> group	Boreal
<i>Thanatus formicinus</i> group	Boreal
<i>Tibellus</i>	Boreal
<i>Diaea</i>	Boreal
<i>Misumenoides</i>	Austral
<i>Misumena</i>	Boreal
<i>Misumenops</i>	Austral
<i>Tmarus</i> , Californian segment	Austral
<i>Xysticus</i> (<i>Pellysticus</i>) <i>pellax</i> group	Boreal
<i>Xysticus</i> (<i>Pellysticus</i>) <i>locuples</i> group	Boreal
<i>Xysticus</i> (<i>Pellysticus</i>) <i>pretiosus</i> group	Boreal
<i>Xysticus</i> (<i>Pellysticus</i>) <i>lutzi</i> group	Austral
<i>Xysticus</i> (<i>Pellysticus</i>) <i>concurus</i> series	Austral
<i>Xysticus</i> (<i>Xysticus</i>)	Boreal
<i>Xysticus</i> (<i>Lassysticus</i>)	Austral
<i>Xysticus</i> (<i>Proxysticus</i>)	Boreal
<i>Xysticus</i> (<i>Psammitis</i>)	Boreal
<i>Coriarachne</i>	Boreal
<i>Ozyptila</i>	Boreal

Most of the boreal groups are broadly Holarctic in distribution, but *Pellocanes* and some groups of the subgenus *Pellysticus* are perhaps restricted to the Nearctic Region. The austral thomisid groups have a primary center apparently either in the Neotropical Region (*Misumenoides* and *Misumenops*) or in the desert and scrub areas of the southwestern Nearctic Region (the remaining groups).

PRIMARY CENTERS OF DISTRIBUTION OF SPECIES

Three criteria were used to judge the primary centers of distribution of thomisid species: (1) the area that represents the center from which dispersion routes appear to radiate, (2) the area in which there is the greatest concentration of individuals of a species, and (3) the area in which there is the least dependence on specialized habitat.

Map 3 illustrates the first criterion. The geographic ranges of certain thomisid species endemic to California are shown. These ranges, insofar as they are known, suggest that a center of radiation is situated in southwestern California. Each species radiates from this area to a different extent. An indication of the primary centers of distribution of the great majority of Californian thomisid species apparently can be gained by this means. The second criterion, by itself, is probably not very reliable. For example, *Xysticus pretiosus* has been collected most frequently in the scrub areas of southwestern California but also occurs in boreal areas of the Pacific northwest. Thus, it might be thought that the primary center of distribution lay in southwestern California. However, when it is considered that (1) *Xysticus* is primarily a boreal group, and (2) the species thought to have a primary center of distribution in the scrub areas of southwestern California do not extend so far north as *X. pretiosus*, it is more likely that the primary center of this species lies in the boreal parts of its range. Southwestern California may be thought of as a secondary center of distribution for *X. pretiosus*. The third criterion is applicable to species such as *Philodromus quercicola*, *P. rufus*, and *Pellocatanes margareta* which, in areas outside their apparent primary center, are restricted principally to a certain plant host or plant community.

FAUNAL ELEMENTS

A faunal element is a group of species that have a common primary center of distribution. For the purpose of the treatment of faunal elements, each primary center of distribution is described here as a geographic area of a particular vegetation type or vege-

tation types. As an example, the thomisid species that have a primary center of distribution in the oak woodland-scrub areas of southwestern and central western California are placed in the same faunal element (the Californian element), even though some of the species have an apparent center in the northern part, while for most species the primary center lies to the south. In this case subelements can be recognized.

The thomisid elements represented in California and their suggested primary centers of distribution are shown in table 2.

It seems likely that faunal elements differentiated during a period in which the ancestral forms were isolated in a common area or areas of the same vegetation type and during which some of the isolated species evolved to become distinct from the ancestral forms or became relict in that area. Subsequently, on the disappearance of the isolating factors, the component species of the newly formed element radiated from the primary center, each according to its own adaptive ability, some overlapping the ranges of species of other elements. The overlapping of the ranges of species of different elements is the condition that generally exists today. Additions could be made to an element during subsequent periods of isolation. Subelements could have arisen by this means.

Secondary centers of distribution also may have arisen during periods of isolation. In such cases, however, the isolated stocks did not markedly differentiate from the mainland populations. If *Xysticus pretiosus* had a secondary center of distribution in southwestern California, as suggested above, subsequent radiation from this center has resulted in an apparent reestablishment of contact and breeding relations between the northern and southern populations. The Great Basin *Tibellus chamberlini* appears also to have a secondary center of distribution in southwestern California but has not yet reestablished contact with the Great Basin populations (see map 21) from which it was probably derived.

The species composition of each element is indicated in table 3. The distribution of the elements is discussed under the Faunal Elements of California (below). In the following

TABLE 2

THOMISID ELEMENTS IN CALIFORNIA AND THEIR SUGGESTED PRIMARY CENTERS OF DISTRIBUTION

Element	Primary Center of Distribution
General Boreal	Uncertain; species Holarctic or broadly Nearctoboreal in distribution
Northern Cordilleran	Coniferous forests of western Canada and northwestern United States
Pacific Maritime	Moist coniferous forests of Pacific coastal North America
Sierra Nevadan	Coniferous forests of the Sierra Nevada
Southern Cordilleran	Coniferous forests of southern Rocky Mountains and Sierra Madre ranges
Great Basin	Intermontane sagebrush areas of Great Basin
Sonoran	Creosote deserts of southwestern Nearctica
Californian	Oak woodland and broad-sclerophyll areas of southwestern California and northwestern Baja California
General Austral	Most species broadly distributed in austral Nearctica, others showing various types of distributions in the west not conforming with those of other austral elements (possibly several elements may be involved)

discussions a species is indicated as belonging to a particular element by the use of the name of the element before that of the species, e.g., the Sonoran *Ebo andreaannae*.

THE BIOTIC PROVINCES OF CALIFORNIA

A biotic province can be defined as a geographic area that differs from other areas in its faunal and floral composition at the species and subspecies level. The fauna of a biotic province comprises an autochthonous faunal element and several allochthonous faunal elements. An autochthonous element is native to a province in the sense of having originated there; an allochthonous element is also native to a province but has originated in another province, i.e., it is an intrusive element. Autochthonous elements are given the same name, here, as the province to which they are autochthonous. For example, the Californian element is autochthonous to the Californian Province. Minor subdivisions of provinces are termed "districts."

Some areas cannot be properly classified as part of a particular province. These annectent areas apparently have derived their fauna from adjacent provinces, i.e., they do not have an autochthonous element.

The biotic provinces and districts for the crab spiders of California are listed below and represented in maps 1 and 2. These biotic areas are based largely on those of Miller (1951) for the Californian avifauna. Modifi-

cations of Miller's boundaries are made to conform to the "Vegetation Types of California" map, mentioned in the Introduction, or to the distribution of crab spiders. The boundaries indicated may be quite subjective, since no two species have exactly the same distribution, or even speculative, since the distribution of the crab spiders is still poorly known. The subjectivity of the boundaries is emphasized by the straight-line boundaries, deliberately so designed, delimiting the districts of the Californian Province.

Pacific Maritime Province
 Humboldtian District
 Santa Cruzian District
Sierra Nevadan Province
 Trinitian District
 Sierran District
 Southern California Montane District
Southern Cordilleran Province
 Inyo Montane District
 Interior Angeles District
Great Basin Province
 Modocian District
 Monoan District
Sonoran Province
 Mojavian District
 Saltonian District
 Yuman District
Californian Province
 Tamalpais District
 Idrian District
 San Diegan District
 Channel Islands District
Annectent Districts
 Shasta Valley

Great Valley
Bullion
Kernian

Some reclassification of Miller's provinces have been made here. The Great Basin and Sonoran provinces of this paper comprise the Interior Province of Miller, and Miller's Channel Islands Province is considered as a district of the Californian Province.

The provinces and districts are described below. The floras are indicated in terms of the plant communities of Munz and Keck (1949, 1950; also Munz, 1959). An alteration of the Munz and Keck scheme is the recognition of a Coastal Oak Woodland community which comprises their Southern Oak Woodland and the woodland of the outer Coast ranges north to Sonoma County dominated by live oaks. A list is given, for each province, of the faunal elements that comprise the fauna of that province. These lists are based on the distributional data of table 3 (excluding the rare, *r*, records). The left-hand column of the lists indicates the number of species of an element known from a province; the right-hand column, its percentage representation in that province as compared to the number of species of that element in the entire state.

PACIFIC MARITIME PROVINCE

This province is, in large part, probably coextensive with the Moist Coniferous biome of Pitelka (1941) and the area occupied by the Vancouverian coleopterous fauna of Van Dyke (1919), i.e., the moist coniferous forests of the Pacific coast from southeastern Alaska southward into Monterey County, California. The appellation "Pacific Maritime" was used by Van Dyke (1919) to denote the southern subdivision of the Vancouverian coleopterous fauna but is employed here to encompass the whole coastal region. The province, in California, is comparable to the Coastal Province of Miller (1951). The predominant forest communities are Northern Coastal Coniferous Forest, Closed-Cone Pine Forest, Redwood Forest, Douglas Fir Forest, and Mixed Evergreen Forest (i.e., in general the plant communities that comprise the Oregonian Province of Munz and Keck, 1949, 1950).

The fauna of the Pacific Maritime Province comprises the following elements:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Pacific Maritime	2	100
Northern Cordilleran	9	60
General Boreal	4	33
Great Basin	1	14
Californian	2	10
General Austral	1	9
	—	
Total species	19	

Two districts can be recognized, the Humboldtian and Santa Cruzian (respectively, the Northern Coastal and the Central Coastal districts of Miller, 1951). Florally, the Santa Cruzian District differs from the Humboldtian in the absence of Northern Oak Woodland and in the more extensive penetration of chaparral, and faunally by the greater number of species of the Californian element.

SIERRA NEVADAN PROVINCE

This is the Sierran Province of Miller (1951). The plant communities in the lower elevations are Yellow Pine Forest or Northern Juniper Woodland and, at higher elevations, Red Fir Forest, Lodgepole Forest, and Subalpine Forest.

The fauna of the Sierra Nevadan Province comprises the following elements:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Sierra Nevadan	7	100
Northern Cordilleran	14	93
General Boreal	10	83
Southern Cordilleran	1	25
Great Basin	1	14
Californian	2	9
	—	
Total species	35	

Three districts are recognized here, the Trinitian (the Trinity of Miller, 1951), Sierran (the Sierran-Cascade and Warner Mountains District of Miller, 1951), and Southern California Montane (Hurd and Michener, 1955; the Southern California Mountains District of Miller, 1951). The plant communities listed above occur, in general, in all the districts, but Northern Juniper Woodland is found only in the Sierran District. The fauna of the Trinitian District differs from that of the Sierran by the apparently more meager representation of the boreal elements. (However, the Trini-



MAP 1. Biotic provinces and districts of California, 1.



MAP 2. Biotic provinces and districts of California, 2.

tian District has been more poorly collected than the Sierran.) Virtually all the species recorded from the Sierra Nevadan Province, including all the species of the Sierra Nevadan element, are found in the Sierran District. The fauna of the district is impoverished in the Northern Juniper Woodland, but *Pellocitanes margareta*, which shows a marked specificity for juniper, flourishes in this community. The fauna of the Southern California Montane District differs from that of the Sierran in the more attenuate representation of the boreal elements, but the Southern Cordilleran *Xysticus apachecus* is present in the former district and not in the latter.

SOUTHERN CORDILLERAN PROVINCE

This province embraces the Pinyon-Juniper Woodland and juniper woodlands in California and the Pinyon-Juniper Woodland and Montane forests of the southern Rocky Mountains and, probably, the Sierra Madre ranges.

The fauna of the Southern Cordilleran Province in California is impoverished and is constituted of the following elements:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Southern Cordilleran	4	100
Northern Cordilleran	3	20
General Austral	2	20
Californian	2	10
Total species	11	

Two districts are recognized here, the Inyo Montane (including the Great Basin Mountains Province of Miller, 1951) and Interior Angeles. *Pinus monophylla* Torrey and Frémont and *Juniperus osteosperma* (Torrey) Little are the dominant plant species in the former district; *P. monophylla* and *J. californica* Carrière, in the latter. The distribution of the species of the Southern Cordilleran element in the province, as shown in table 3, is the basis for the recognition of the districts. The allochthonous species composition is also quite different.

GREAT BASIN PROVINCE

This province comprises the intermontane areas of the Great Basin and perhaps the very large area occupied by the Great Basin coleopterous fauna of Van Dyke (1919). In

California the predominant plant community is Sagebush Scrub.

The Great Basin fauna in California consists of the following elements:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Great Basin	7	100
General Austral	7	64
Northern Cordilleran	9	60
Sonoran	4	25
General Boreal	3	25
Sierra Nevadan	1	17
Californian	2	10
Total species	33	

The high incidence of species of the boreal elements is interesting, since this is a xeric province. Two districts may be recognized, the Modocian (the Modoc of Miller, 1951) and Monoan. The vegetation of both districts is similar. The most striking faunal difference is the more extensive penetration into the Monoan of the fauna of the Sonoran Province.

SONORAN PROVINCE

This province comprises the Mojave and Sonoran deserts. The principal plant community in California is Creosote Bush Scrub, but there is also Joshua Tree Woodland, Shadscale Scrub, and Alkali Sink (i.e., the communities of the Southern Desert Province of Munz and Keck, 1949).

The fauna of the Sonoran Province is constituted of the following elements in California:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Sonoran	16	100
General Austral	5	46
Northern Cordilleran	1	7
Californian	1	5
Total species	23	

This is the only province in California in which the number of species of the autochthonous element is greater than that of the allochthonous elements. Three districts can be recognized: the Mojavian, Saltonian, and Yuman. Faunally, the districts can be contrasted as follows: *Philodromus infuscatus* and *Rhysodromus californicus* appear to be distributed generally in the Mojavian, but

neither has been taken in the interior of the Saltonian (however, *infuscatus*, common in the Southern Californian Province, spills over into the western edge of the Saltonian). *Thanatus peninsulanus* and *Xysticus lassanus*, common in the Saltonian, have been taken only in the southern edge of the Mojavian; *Philodromus coachellae* and *Ebo merkei*, each known only by the holotype, have been taken in the western edge of the Saltonian but not in the western edge of the Mojavian. The fauna of the Yuman District includes the more typically Arizonan and Mexican forms which fail to penetrate farther westward from Arizona or northward from Baja California than other species of the fauna of the Sonoran Province. The species apparently restricted to the Yuman District are *Philodromus anomalus*, *Misumenops dubius*, *M. celer*, *X. lutzii*, and a race of *Misumenops deserti* in which the female shows a variation in facies and genitalia tending toward the *M. celer* condition.

The western edge of the Mojavian and Yuman districts, perhaps owing to more extensive collecting, appears to have a richer fauna than the interior portion. There occur in the western edge: (1) possibly relict species (*Philodromus droseroides*, *P. coachellae*, and *Ebo merkei*) which may also occur, disjunctly, in areas outside California, as is the case with many species of desert plants, (2) species generally distributed in the Sonoran areas of California but which are more abundant here (e.g., *Ebo creosotis*, *E. andrea-annae*, *E. dispar*), and (3) cismontane allochthonous species not extending farther eastward into the deserts.

CALIFORNIAN PROVINCE

This province takes in the oak woodland and most of the broad-sclerophyll areas (scrub and chaparral) of the Coast and Transverse ranges and the Peninsular ranges of California and northern Baja California. The plant communities of the province are Northern Oak Woodland, Coastal Oak Woodland, Foothill Woodland, Valley Grassland, Northern Coastal Scrub, Coastal Sage Scrub, and chaparral. Some of these communities occur also in the Santa Cruzian, Great Valley, and Bullion districts and thus do not define

the boundaries of the province.

The fauna of the Californian Province comprise the following elements:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Californian	20	100
Pacific Maritime	2	100
General Austral	10	91
Northern Cordilleran	9	60
General Boreal	5	42
Sierra Nevadan	1	17
Sonoran	1	6
	—	
Total species	48	

The Californian Province supports the richest thomisid fauna, in numbers of species and representation of faunal elements, of the state. Miller (1951) recognized four districts for the avifauna. The available thomisid records, which are scanty in the central and northern portions, suggest that three mainland districts would be more appropriate for this group: San Diegan (in a more restricted sense than Miller's San Diego District), Idrian, and Tamalpais. The thomisid faunas of New Idria (San Benito County) and of Mt. Tamalpais (Marin County), and adjacent areas, are more or less representative for the districts named after them. The vegetation of the districts of the Californian Province is similar, but chaparral is more extensively developed in the south, Northern Coastal Scrub replaces Coastal Sage Scrub in the north, and Northern Oak Woodland is present only in the Tamalpais District.

The northern boundary of the San Diegan District is based on the known distributions of *Philodromus orarius*, *P. josemitensis* (map 7), *Thanatus formicinus* (map 19), typical *Misumenops importunus belkini* (map 28), and *Xysticus i. iviei* (map 37). A projected pattern of distribution of *Misumenops devius* to the north, however, is suggestive of the more northern limit of Miller's San Diego District. The Tamalpais-Idrian boundary is based on the northernmost records of *Philodromus g. gertschi* (map 7), *P. verityi* (map 10), and *Xysticus chaparralis* (map 34) and the southernmost record of *Philodromus gertschi diablæ* (map 7).

There is a decrease in the representation of

the Californian element northward in the Californian Province, although some northern forms (*Philodromus gertschi diablae*, *Misumenops quercinus*, and *M. verityi*) do not occur in the San Diegan District or are found only in the northernmost portion. There is a decrease in the representation of the boreal elements southward.

The Channel Islands Province of Miller (1951) is treated as a district of the Californian Province here. The four species known from the islands are common on the adjacent mainland of the San Diegan District.

ANNECTENT DISTRICTS

SHASTA VALLEY DISTRICT: I have no records of crab spiders from this area. Miller (1951) noted that the avifauna of Shasta Valley shows affinities to that of the Californian area and that of the Great Basin area.

GREAT VALLEY DISTRICT: This district takes in the Valley Grassland of the Sacramento and San Joaquin valleys and the Foothill Woodland of the eastern slopes of the northern Coast ranges and western slopes of the Sierra Nevada. The number of species that have been found in this district is small, when the size of the area is considered. The Foothill Woodland areas are included in the district for convenience, since its fauna is not very distinctive. (However, the General Boreal *Philodromus rufus* and General Austral *Tmarus angulatus* have been taken in the Foothill Woodland but not in Valley Grassland.) The Southern Cordilleran *Philodromus marginellus* and the Sonoran *Ebo mexicanus* extend into the Great Valley District apparently only along the southwestern margins, the former species having been taken solely upon *Juniperus*.

The following elements are represented:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
General Austral	6	55
Great Basin	2	29
Southern Cordilleran	1	25
Sonoran	3	19
General Boreal	2	17
Northern Cordilleran	2	13
Californian	2	10
Total species	18	

Miller (1951), apparently including the chaparral areas of the North Coast ranges and Sierra Nevada foothills as well as the grassland and oak woodlands of the Great Valley in his Great Valley area, recorded 12 of the 13 species of the avian Californian element from this district. Thus, Miller treated the Great Valley as part of the Californian Province. In contrast, the thomisid Californian element is poorly represented in the Great Valley, only two of the 18 species having been recorded from this area (five species of the Californian element would be represented if the chaparral areas of the North Coast ranges and Sierra Nevada foothills were included here in the Great Valley District).

BULLION DISTRICT: This district, named after Mt. Bullion in Mariposa County, comprises the generally narrow zone of chaparral developed along the Great Valley slopes of the northern Coast ranges and the Sierra Nevada. The Bullion District has been very poorly collected. The following elements are known from this district:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Northern Cordilleran	4	27
General Austral	2	18
Californian	3	15
Sierra Nevadan	1	14
Total species	10	

Although the vegetation of the Bullion District appears to be an extension of the chaparral of the Californian Province, only three species of the thomisid Californian element have been found here. In contrast, Hurd and Michener (1955) consider the Sierra Nevadan segment of this district (perhaps together with the adjacent Foothill Woodland) as an extension of the Californian Province for megachiline bees.

KERNIAN DISTRICT: This district is roughly equivalent to the upper Kern Basin annectent area of Miller (1951), but the Pinyon-Juniper Woodland is classified here with the Interior Angeles District. The vegetation in those parts collected for crab spiders is chaparral and juniper woodland.

The following thomisid elements have been found in this district:

	NO. OF SPECIES	PERCENTAGE OF ELEMENT
Northern Cordilleran	4	27
General Austral	3	27
Southern Cordilleran	1	25
Great Basin	1	14
Californian	2	10
Total species	11	

Based on these limited data, the fauna of the Kernian District would appear to be derived principally from the Sierra Nevadan and Californian provinces. The three General Austral species and the Great Basin species (*Tibellus chamberlini*) apparently have radiated from secondary centers in the Californian Province.

CONCLUSIONS

The fauna of the provinces described comprise, on the average, six different faunal elements (ranging from four to eight elements), one of which is autochthonous and the remainder allochthonous. The autochthonous element is, naturally, always represented 100 per cent in its province, and the allochthonous elements usually much more poorly so, on the average about 33 per cent. To be noted are the high allochthonous Northern Cordilleran (93%) and General Boreal (83%) representations in the Sierra Nevadan Province and the high Pacific Maritime (100%) and General Austral (91%) representations in the Californian Province. The presence of several faunal elements in each province indicates the diverse origins of their modern faunas.

THE THOMISID ELEMENTS OF CALIFORNIA

The general distribution of the thomisid elements represented in California and the distributions of some of the component species are discussed in this section. The species composition of the elements is indicated in table 3.

GENERAL BOREAL ELEMENT

The species of the General Boreal element are Holarctic or broadly Nearctoboreal in distribution, mostly the former.

Twelve General Boreal species are known from California, all belonging to boreal groups and occurring largely in the northern

boreal areas of the state. Aside from the records of the few General Boreal species from the Great Basin districts (these may be considered as marginal), only four species are distributed extensively in the austral areas of the state. Two of these are restricted to a particular plant community: *Philodromus rufus* to oak woodland and *Thanatus formicinus* to Coastal Oak Woodland (there are no boreal records of *formicinus* from California). Only two species of the element have been taken in the Southern California Montane District.

The cerambycid Holarctic element of Linsley (1958) corresponds in large part to the thomisid General Boreal element. Linsley suggests that the distribution of the Holarctic element reflects postglacial dispersal but points out that a few species are represented in the high-altitude coniferous forest as far south as Guatemala. Some of the General Boreal thomisids occur at least as far south as Mexico, probably in coniferous forest.

NORTHERN CORDILLERAN ELEMENT

The primary center of distribution of this element apparently lies in the coniferous forests of the Cordilleran ranges of western Canada and northwestern United States. Some of the species extend southward into California and the southern Rocky Mountains, and a few are known from Mexico. Possibly some of the species also occur in eastern Asia.

The Northern Cordilleran element is represented by 14 species in California, all but one of the species belonging to boreal groups. Especially well represented is the genus *Xysticus*. The element tends to be more generally distributed throughout the state in both boreal and austral areas than the General Boreal element. In contrast to the latter element, the great majority of the Northern Cordilleran species are found in the Southern California Montane District and many occur in the Great Basin, Californian, and adjacent districts and in the western margins of the Mojave and Colorado deserts.

One of the more interesting distributions of a Northern Cordilleran species is shown by *Xysticus locuples* (map 33).

Two extreme phases of *locuples* are evident, the locupline and malkinine forms, differing

strikingly in coloration, markings, and carapace chaetotaxy (but not in the structure of the genitalia), but in California, at least, all grades of intermediates are found. The malkinine form is primarily boreal and occurs in the Pacific northwest from Vancouver Island (Gertsch, 1953) southward to central California, with one taxonomically uncertain record farther south in the San Bernardino Mountains. The locupline form is apparently sympatric with the malkinine form throughout a large part of the range of the latter but also occurs extensively in austral areas of California, the Southern California Montane District, and in the Southern Cordilleran Province from California into Mexico as well as in the Rocky Mountain states (the extra-Californian distributions are based on records in Gertsch, 1953). If these different morphological types do not represent ecotypes, it is possible to interpret the data as indicating that actually three taxa comprise *locuples* in the Pacific coast states, one taxon represented by the malkinine form, the second by a northern locupline form that does not hybridize with the latter, and the third by a southern locupline form, distributed widely in California, that can hybridize with the malkinine form. The intermediate Californian forms could then be explained by hybridization of the malkinine and southern locupline forms which has occurred perhaps as a consequence of a postglacial northward extension of the latter.

Two of the Northern Cordilleran species extend out of the montane forests only in restricted habitats, *Pellocatanes margareta* on *Juniperus* spp. and *Xysticus gosiutus* in chaparral. The distributions of two other species of this element, *Xysticus gertschi* and *X. californicus*, may also be noted. *Xysticus gertschi*, scarcely known in boreal areas of the state, is common in the Great Basin Province, the San Diegan District, and in the margins of the southern deserts (map 36). This species is considered as a member of the Northern Cordilleran element on the basis of its Vancouver Island and other western Canadian records (Gertsch, 1953), which indicate a boreal primary center of distribution since the genus is primarily boreal. The abundance of *gertschi* in austral areas suggests that secondary centers are involved there. *Xysti-*

cus californicus, although common in boreal areas of California and in cismontane austral areas throughout much of the state, including southern California, is rare in the Southern California Montane District, whence it is known from only one marginal record (map 36). This suggests that *californicus* is a later arrival in California than most other species of the element.

PACIFIC MARITIME ELEMENT

The primary center of this element is in the moist coniferous forests of western Canada and the United States.

Two species comprise the Pacific Maritime element in California, both belonging to boreal groups. These species extend into California from the north southward into the Californian Province where they remain largely coastal.

This element apparently corresponds to the Vancouverian cerambycid fauna of Linsley (1958) limited to the Pacific coast.

SIERRA NEVADAN ELEMENT

This element, the species of which are known only from California, is centered in the montane forests of the Sierra Nevada. Seven species can be recognized in this element, five belonging to boreal groups and two to austral groups. None of the species is known from the Southern California Montane District. The three Sierra Nevadan species of *Oxyptila* and *Xysticus iviei sierrensis* (which all belong to boreal groups) are possibly limited to a leaf humus or ground habitat. *Philodromus quercicola* shows a marked preference for oaks outside the montane forests and is an important species of the Coastal Oak Woodland fauna in the Californian Province.

Linsley (1958) lists several cerambycid species which might be endemic to the Sierran-Cascade ranges, and these would correspond to the thomisid Sierra Nevadan element. Van Dyke (1919) states that some of the Vancouverian coleopterous fauna have segregated in the Sierra Nevada Range into distinct species and subspecies "serving thereby to define this as a distinct subregion and one with a fairly well-defined secondary fauna."

SOUTHERN CORDILLERAN ELEMENT

The primary center of distribution of this element probably lies in the montane forests or pinyon-juniper areas of the southern Rocky Mountains or Sierra Madre ranges.

Four species of the Southern Cordilleran element are found in California, three belonging to boreal groups and one to an austral group. These species inhabit the faunally impoverished Pinyon-Juniper Woodland communities of the state. Two of the species show marked plant specificity, *Philodromus marginellus* (the juniper *Philodromus*) for *Juniperus californica*, and *Philodromus pinyonelis* (the pinyon *Philodromus*) for *Pinus monophylla* (pinyon pine). In the following discussion regarding relationships between these two spiders, a third species must also be considered, the Northern Cordilleran *Pellocatanes margareta* (the juniper *Pellocatanes*), which is limited to *Juniperus californica* and *J. osteosperma* in the Southern Cordilleran Province of California.

In the Interior Angeles District (of the Southern Cordilleran Province), where the two species of *Philodromus* are found, the pinyon *Philodromus* is found either in juniper-free, pinyon-pine areas or in mixed pinyon pine-juniper areas, in the latter case the spider occurring on the juniper as well. The juniper *Philodromus*, however, has not been taken in the mixed areas. Thus, the pinyon *Philodromus* appears to supplant the juniper *Philodromus* where their usual host plants occur together. On the other hand, the pinyon *Philodromus* and the juniper *Pellocatanes* have been taken in the same collections in mixed pinyon-juniper areas of the Inyo Montane District. The juniper *Pellocatanes* is also sympatric with the juniper *Philodromus* in the Interior Angeles District, both species of spiders even being taken on the same host plant. These data suggest that there is competition between the two species of *Philodromus* but not between those of *Pellocatanes* and either species of *Philodromus*.

The phyletic affinities of the three Southern Cordilleran species of boreal groups, *Philodromus pinyonelis*, *P. marginellus*, and *Xysticus apacheus*, indicate that this element is at least in part derived from the Northern Cordilleran element. *Philodromus pinyonelis* and *Xysticus apacheus* are closely related to

the Northern Cordilleran *P. spectabilis* and *X. locuples*, while *P. marginellus* belongs to the same taxonomic group as *pinyonelis*. Whether these Southern Cordilleran species have differentiated in or near their present ranges or are remnants of a former wave of the Northern Cordilleran element is unknown.

GREAT BASIN ELEMENT

The primary center of distribution of this element lies in the intermontane sagebrush scrub areas of the Great Basin.

The Great Basin element comprises seven species in California, five belonging to boreal groups and two to austral groups. The following three species show interesting distributions outside the Great Basin Province. *Rhysodromus histrio clarus* extends well into the Sierran District along with intrusive sagebrush scrub plants. *Xysticus knowltoni* occurs to an important extent in leaf litter in coastal California, a habitat in which other members of the genus are scarce. *Tibellus chamberlini*, a grass inhabitant, is rare in the Great Basin Province of California but flourishes throughout most of austral cismontane California and is even recorded from the Channel Islands District; the Californian cismontane *chamberlini* is apparently completely disjunct from the Great Basin populations. *Chamberlini* is apparently not present in the Monoan District where *T. rothi*, another grass inhabitant, occurs.

Linsley (1958) and Van Dyke (1919) concluded that the Great Basin coleopterous fauna is primarily a derivative of the Sonoran fauna. The Great Basin thomisids, on the other hand, appear to have been primarily derived boreally. Five of the seven Great Basin thomisids belong to boreal groups. A sixth species, *Xysticus coloradensis*, belongs to the *Xysticus concursus* series, a group that is classified as austral here but that may more appropriately be considered as boreal, since it is allied to the Palearctic *Xysticus longipes* group of Simon.

SONORAN ELEMENT

The primary center of distribution of this element lies in the Mojave and Sonoran deserts.

Sixteen species of thomisids comprise the Sonoran element in California, all but one be-

longing to austral groups. The genus *Ebo* is especially well represented. The Sonoran-element species are markedly xerophilic, and the great majority do not extend far beyond the deserts or fringing juniper-dominated areas. Four of the species have been collected in the Great Basin Monoan District but none in the Modocian. Excepting *Thanatus peninsulanus*, which should possibly not be considered as Sonoran, *Misumenops deserti* is the only species of the element that has penetrated significantly into a non-desert area. The highly variable *deserti* is represented by a possibly distinct subspecies in the San Joaquin Valley. Only one of the species of the element is plant specific, *Ebo creosotis*, which is apparently restricted to *Larrea divaricata* Cavanilles (creosote bush).

The thomisid species of the Sonoran element show three general patterns of distribution in the Sonoran Province of California: (1) a general distribution in all three districts, (2) a limitation to the Yuman District (representing western extensions from Arizona and northward extensions from Baja California), and (3) an apparently relict distribution in the western margins of the deserts.

CALIFORNIAN ELEMENT

The primary center of distribution of this element lies in the broad-sclerophyll-oak woodlands areas of western California and Baja California. Twenty-two species comprise the element, nine species belonging to boreal groups and 13 to austral groups. *Misumenops* is a major component of the element.

Many of the Californian-element thomisids are virtually limited to or show a strong preference for specific host plants: *Philodromus verityi*, *Misumenops verityi*, and *M. devius* for certain species of *Arctostaphylos* (manzanita); *Philodromus chamisis* for *Aadenostoma fasciculatum* Hooker and Arnott (chamise); *Philodromus californicus* and *Diadema pictilis* for live oaks (principally *Quercus agrifolia* Neé); and *Misumenops quercinus* for deciduous oaks (*Quercus garryana* Douglas, *Q. douglasii* Hooker and Arnott). The relationship between the distributions of the three manzanita thomisids is interesting in that *M. verityi* and *M. devius*, which are the only

Californian species of the *Misumena asperata* group, are apparently just barely allopatric (map 30), while *P. verityi* overlaps their ranges (map 10). Also of note is the occurrence of *M. quercinus* in an isolated stand of blue oak (*Q. douglasii*) in the San Joaquin Valley (map 25).

Some of the Californian-element thomisids which are not plant-host specific have been collected only in certain plant communities: *Philodromus orarius* and *Xysticus iviei iviei* in Coastal Sage Scrub and *Misumenops gabriellensis* and *Xysticus chaparralis* in chaparral (also several species of the element, e.g., *Misumenops aikoeae*, are particularly abundant in chaparral). The Northern Cordilleran *Xysticus gosiutus*, which is closely related to *X. chaparralis* (possibly ancestral to the latter), also appears to be restricted to chaparral communities (outside its boreal habitat in California). These two species have a complementary distribution in the chaparral areas of the state (map 34).

Most of the Californian-element thomisids have an apparently primary center of distribution in the southern part of the Californian Province (map 3). This southern subelement corresponds to the Californian cerambycid element in the "narrowest" sense of Linsley (1958). However, *Philodromus gertschi diablae*, *Misumenops quercinus*, and *M. verityi* appear to have a primary center in the northern part of the province. These species form a northern subelement (perhaps more than one) which apparently corresponds in part to the Californian element in the "broader" sense of Linsley. The latter, according to Linsley, includes cerambycid "elements" now occurring in the eastern Coast ranges and western foothills of the Sierra Nevada in California (as do several thomisids of the Californian element) as well as in some montane areas of southwestern United States outside California.

If it be assumed that the primary center of distribution of the southern subelement lies in southwestern California, some speculations can be made regarding historical relationships between the Northern Cordilleran *Misumenops i. importunus* and the Californian *M. i. belkini* and *M. aikoeae*. It is suggested that *belkini* and *aikoeae* differentiated as part of the southern subelement and subsequently

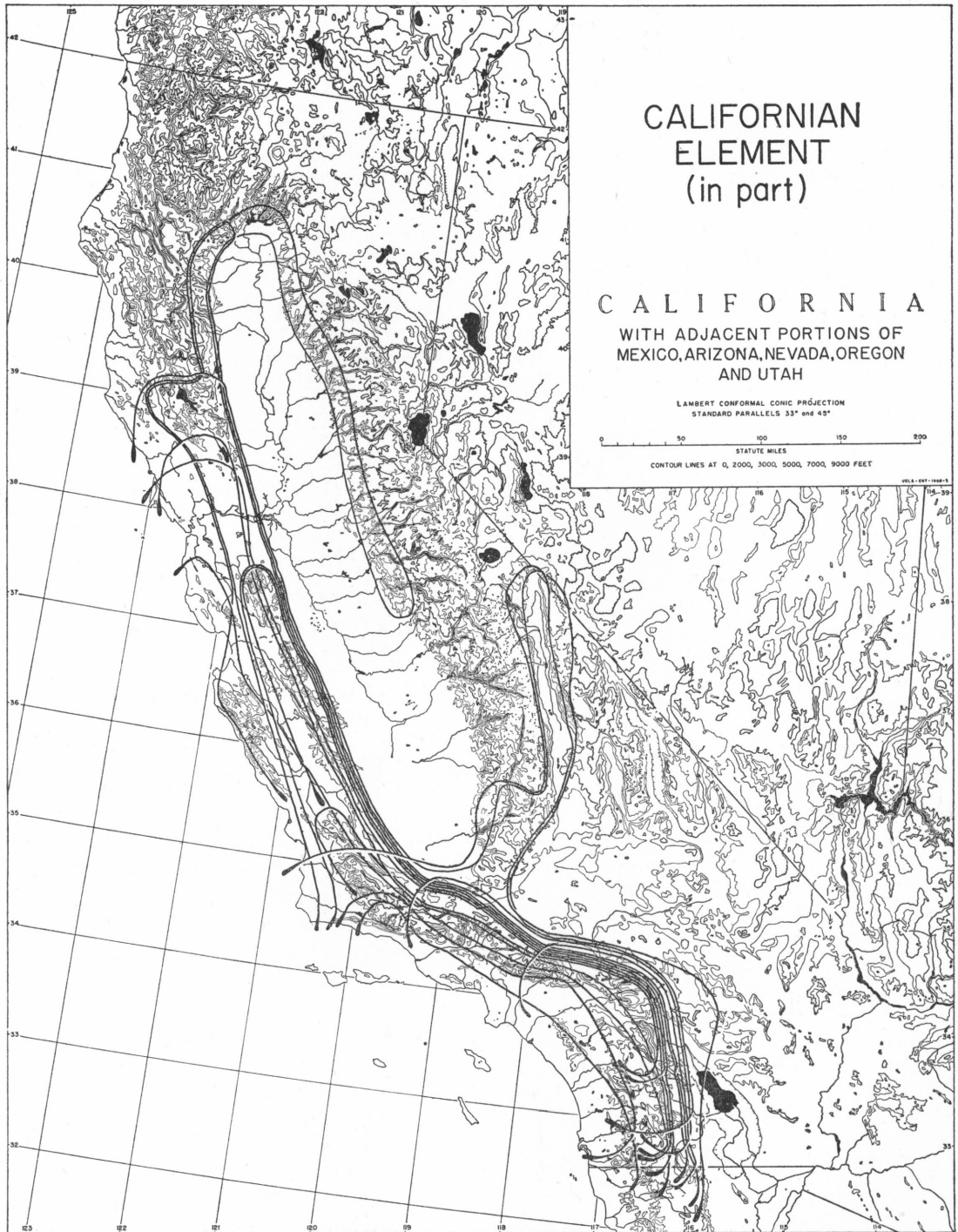
TABLE 3
THE FAUNAL ELEMENTS OF CALIFORNIA AND THE DISTRIBUTION OF THE SPECIES BY
BIOTIC PROVINCE AND DISTRICT^a

Faunal Element	Group Center	Pacific Maritime Humboldtian	Santa Cruzian	Sierra Nevada Trinitarian	So. Calif. Sierran	So. Cordilleran Inyo Montane	Great Basin Modocan	Mojavian Saltonian	Tamalaipan	Californian Idrian	San Diegoan	Channel Islands	Great Valley	Annectant Bullion Kernian
GENERAL BOREAL														
<i>Philodromus cephalum</i>	B	X	X	X	X	—	—	—	S	S	—	—	S	—
<i>Philodromus rufus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Rhyssodromus a. alascensis</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Thanaos striatus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Thanaos formicinus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Thanaos coloradensis</i>	B	X	X	—	—	—	X	—	X	X	—	—	X	—
<i>Tibellus oblongus</i>	B	X	X	—	—	—	—	—	X	—	—	—	—	—
<i>Misumena valia</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus gulosus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus punctatus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus ulanensis</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Oxyphila nevadensis</i>	B	—	—	X	—	—	—	—	—	X	—	—	—	—
NORTHERN CORDILLERAN														
<i>Philodromus spectabilis</i>	B	—	—	Y	X	X	X	X	X	X	—	—	r	X
<i>Philodromus speciosus</i>	B	—	—	X	X	—	—	—	—	—	—	—	—	—
<i>Philodromus rodecki</i>	B	—	—	X	X	—	—	—	—	—	—	—	—	X
<i>Philodromus insperatus</i>	B	—	—	X	X	S	—	—	—	—	—	—	—	S
<i>Pellicianes margarita</i>	B	r	—	—	—	—	—	—	—	—	—	—	—	—
<i>Thanaos altimontis</i>	B	X	X	X	X	r	X	r	X	X	—	—	X	X
<i>Misumenops lepidus</i>	A	X	X	X	X	—	—	—	—	—	—	—	—	—
<i>Misumenops i. im-portunus</i>	A	X	X	X	X	—	—	—	—	—	—	—	—	—
<i>Xysticus locuples</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus gossulus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus gerstae</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus californicus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus montanensis</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus benedictor</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus brunneipes</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
PACIFIC MARITIME														
<i>Philodromus josemitensis</i>	B	X	X	—	—	—	—	—	S	S	—	—	r	—
<i>Xysticus pretiosus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
SIERRA NEVADAN														
<i>Philodromus quercicola</i>	B	—	—	X	—	—	—	—	S	S	—	—	—	S
<i>Apollonius francisca</i>	A	—	—	X	—	—	—	—	—	—	—	—	—	—
<i>Misumenops sierrensis</i>	A	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus t. sierrensis</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Oxyphila inglesi</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Oxyphila yosemite</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Oxyphila schusteri</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
SOUTHERN CORDILLERAN														
<i>Philodromus physignathus</i>	B	—	—	—	—	S	—	—	—	—	—	—	S	—
<i>Philodromus marginatus</i>	B	—	—	—	—	X	—	—	—	—	—	—	—	—
<i>Misumenops coloradensis</i>	A	—	—	—	X	—	—	—	—	—	—	—	—	—
<i>Xysticus apachiens</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
GREAT BASIN														
<i>Philodromus agrestis</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Rhyssodromus h. clarius</i>	B	—	—	—	r	—	X	—	—	—	—	—	X	—
<i>Rhyssodromus a. dondalei</i>	B	—	—	—	—	—	X	—	—	—	—	—	—	—
<i>Ebo macyn</i>	A	—	—	—	—	—	X	—	—	—	—	—	—	—
<i>Tibellus chamblertini</i>	B	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus coloradensis</i>	A	r	r	—	r	—	—	—	X	X	—	—	X	X
<i>Xysticus knoxdani</i>	B	—	X	—	X	—	—	—	—	—	—	—	—	—

TABLE 3—(Continued)

Faunal Element	Group Center	Pacific Maritime Hum-boldtian	Sierra Nevada	So. Calif. Montane	So. Cordilleran Inyo	Great Basin Modocian	Mojavian	Tamalpais	Californian Idrian	San Diegoan	Channel Islands	Great Valley	Annectent Bullion Kernian
SONORIAN													
<i>Philodromus droseroides</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Philodromus cochellae</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Philodromus anomalus</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Ebo mexicanus</i>	A	—	—	—	—	—	X	—	—	—	—	S	—
<i>Ebo albocaudatus</i>	A	—	—	—	—	—	S	—	—	—	—	—	—
<i>Ebo creosolus</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Ebo andreaeanae</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Ebo dispar</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Ebo merheli</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Thanaos pennsylvanus</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Tibellus rohi</i>	B	—	—	—	—	—	X	—	—	—	—	—	—
<i>Misumenops dubius</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Misumenops deserti</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Xysticus lutei</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Xysticus agilis</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
<i>Xysticus lassanus</i>	A	—	—	—	—	—	X	—	—	—	—	—	—
CALIFORNIAN													
<i>Philodromus chamisii</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus ornatus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus f. gerischi</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus f. diablae</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus verticis</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Ebo californicus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Tibellus californicus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Draea bicolor</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops guercinus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops gabriellensis</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops gilviger</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops californicus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops i. bellus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops albica</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops verticis</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops dentus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>T. maris salus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus chaparralis</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus t. t. t. t. t.</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Xysticus pearcei</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
GENERAL AUSTRAL													
<i>Philodromus californicus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus infusatus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Philodromus h. californicus</i>	B	—	—	—	—	—	—	—	—	—	—	—	—
<i>Ebo parabolis</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Ebo pepinensis</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Apolophanes tezama</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenoides formosipes</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenoides oblongus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops rohi</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Misumenops celer</i>	A	—	—	—	—	—	—	—	—	—	—	—	—
<i>Tmarus angulatus</i>	A	—	—	—	—	—	—	—	—	—	—	—	—

^a Symbols: A, austral group; B, boreal group; r, rare or marginal records; S, restricted, or nearly so, to a particular habitat or plant community; X, common in a district, relative to distribution elsewhere; Y, same as X, but not indicated on distribution map.



MAP 3. Distributions of the species of the southern subelement of the thomisid Californian faunal element.

radiated from the primary center. *Belkini* spread farther east, since *aikoeae*, more a chaparral form, was limited by the deserts (compare maps 28 and 29). The extension of *belkini* (as a recognizable entity) northward was limited by *importunus*, with which *belkini* hybridized, while *aikoeae* extended farther north, since this species encountered no "introgression barrier." Of further interest, some *belkini* characters are found in specimens of *importunus* north of the range of *belkini*.

The Californian thomisid element is not simply a derivative of an austral fauna. Nine of the 20 species of the element (including *Xysticus chaparralis*, mentioned above) belong to boreal groups.

GENERAL AUSTRAL ELEMENT

The General Austral element comprises forms which show primarily austral distributions but of which the elemental affinities are not clear. However, most of the species show similarities in distribution by their occurrence in the San Diegan, Great Valley, and Monoan districts, in the margins of the southern deserts and general absence in boreal areas.

Many of the General Austral species appear to have a secondary center of distribution in the San Diegan District. These species possibly were isolated together with the Californian element but did not differentiate or become relict to become a part of that element. However, the Californian *Philodromus verityi*, *Ebo californicus*, and *Tmarus salai* are, respectively, closely related to the General Austral *P. infuscatus*, *E. parabolis*, and *T. angulatus*, which suggests that at least some erstwhile General Austral forms did differentiate. The derivation of *P. verityi* from *P. infuscatus* is interesting in regard to two mechanisms which may serve to isolate these species today, the specificity of *verityi*

for manzanita and the difference in temporal distribution of the adults.

SUMMARY AND CONCLUSIONS

The crab-spider fauna of California comprises at least nine faunal elements, five boreal and four austral. The total number of species of the boreal elements is 39 and of the austral elements 55; thus, more of the species have primary centers of distribution in austral areas. However, the bulk of the fauna of the state apparently has been derived from the north, 52 of the species belonging to boreal groups and 42 to austral groups. Two of the elements, the Sierra Nevadan and Californian, are endemic to the state, and the others are intrusive. The origins of the australy centered Californian and Great Basin elements are of interest, since many of the species of the former and most of the species of the latter belong to boreal groups. A surprisingly high proportion of the Californian-element species show marked host-plant specificity.

The species that comprise a faunal element often show a similar type of distribution beyond the biotic province to which they are autochthonous, especially when the ranges of the General Boreal and Northern Cordilleran elements are contrasted. Deviations from such a distribution might be related to the length of time a species has been associated with the others of an element. The distributions of the General Boreal *Thanatus formicinus*, the Northern Cordilleran *Xysticus gertschi*, and the Californian *Misumenops verityi* suggest that they are older constituents of their elements than most of the other species, while the distribution of the Northern Cordilleran *Xysticus californicus* suggests that it is younger. Some species extend out of the biotic province to which they are autochthonous only on a particular host plant (e.g., *Pellocanes margareta*) or in association with a particular vegetation type (e.g., *Xysticus gosiutus* in California).

TAXONOMIC TREATMENT

FAMILY THOMISIDAE

Thomisides SUNDEVALL, 1883, p. 27.
 Thomisidae SIMON, 1895, p. 761; 1897, p. 1;
 1903, p. 669. F. PICKARD-CAMBRIDGE, 1900, p.
 127. MELLO-LEITÃO, 1929, p. 9.

Nearctic Thomisidae can be distinguished from other spider families by the following characters: the homogeneously colored eyes (however, in life the AME appear lighter than the others), the free rather than fused chelicerae the lower margin of which is indistinct and unarmed, the bearing of two toothed tarsal claws on each latigrade leg, one pair of book lungs, a single medial tracheal opening near the spinnerets, and the absence of a cribellum and calamistrum.

Four subfamilies of the Thomisidae are known from Nearctica: the Philodrominae, Aphantochilinae, Stephanopsinae, and Thomisinae. In the United States only the Philodrominae and Thomisinae are major elements of the araneid fauna, the Aphantochilinae being known only from one species of *Majella* from the southern Rio Grande Valley in Texas and the Stephanopsinae from a species of *Isaloides* from the southern mountains of Arizona (Gertsch, 1953).

KEY TO THE GENERA OF THOMISIDAE IN CALIFORNIA

1. Legs III and IV similar in length to leg I.
 Body with vestiture of recumbent setae (subfamily Philodrominae) 2
- Legs III and IV less than half of length of leg I. Body with vestiture of sparse, erect setae but carapace in some cases with recumbent setae (subfamily Thomisinae) 10
- 2(1). Posterior row of eyes not strongly recurved (PE recurvature index less than 1.5); PME closer to PLE than to each other (PME interdistance index 1.2 or greater). Tegular suture present in male palpus (except in *Pelloctanes*) 3
- Posterior row of eyes strongly recurved (PE recurvature index greater than 1.5); PME either closer to each other than to PLE or these eyes more or less equidistantly spaced (PME interdistance index as great as 1.2, but usually less). Tegular suture absent in male palpus 8

- 3(2). PME closer to PLE than to ALE or these eyes subequidistant 4
- PME closer to ALE than to PLE 5
- 4(3). Telotarsi usually thinly scopulate; basitarsus I usually with at least one proapical spiniform. Tegular suture present in male palpus *Philodromus*
- Telotarsi densely scopulate; basitarsus I without a proapical spiniform. Tegular suture absent in male palpus *Pelloctanes*
- 5(3). Males 6
- Females 7
- 6(5). Embolus arcuate basally, directed proximad (as in fig. 93); PCA lacking. Tibia longer to slightly shorter than cymbium, tibial length index at least 7.5; RTA usually with two or more apical teeth, occasionally with only one which is directed ventrad *Ebo*
- Embolus not arcuate basally, directed retrolaterad; PCA present, in some cases reduced, as shown in figure 81. Tibia distinctly shorter than cymbium, index at most 5.0; RTA usually without an apical tooth *Rhysodromus*
- 7(5). Epigynum with a pair of posterior plates, without a median septum or lateral guides, epigynal suture hidden, situated entirely in epigastric furrow (as in fig. 97) *Ebo*
- Epigynum without posterior plates; a distinct median septum or a lateral guide pocket present (as in figs. 82, 88); epigynal suture developed on ventral surface of abdomen as well as in epigastric furrow *Rhysodromus*
- 8(2). PME much closer to each other than to PLE (PME interdistance index markedly less than 1.0) *Tibellus*
- PME and PLE nearly equidistant or PME closer to PLE than to each other 9
- 9(8). Basitarsus I with a proapical spiniform. Embolus of male palpus arising on pro-lateral side of tegulum near 270 degrees. Intromittent orifice of epigynum a large, funnel-like aperture opening in posterior portion of epigynum (figs. 112, 113) *Apollophanes*
- Basitarsus I without a proapical spiniform. Embolus of male palpus arising at distal end of tegulum near 0 degree. Intromittent orifice of epigynum usually obscure, in anterior portion of epig-

- ynum, as in figure 140 . . . *Thanatus*
- 10(1). Basitarsus I with two proapical spiniforms11
 Basitarsus I with one proapical spiniform13
- 11(10). Carapace seta A1 markedly shorter than A2; X-seta absent; seta T5 a principal element of the metadiscal vestiture *Diaea*
 Carapace setae A1 and A2 subequal in length; X-seta present, in some cases reduced; seta T5 not a principal element of the metadiscal vestiture . . .12
- 12(11). Disc and allatum separated by a deep cervical groove. Anterior eye row nearly straight *Coriarachne*
 Cervical groove indistinct. Anterior eye row moderately recurved . . . *Xysticus*
- 13(10). Clypeus strongly sloping. Abdomen usually with a distinct dorsocaudal tubercle *Tmarus*
 Clypeus vertical. Abdomen without a dorsocaudal tubercle14
- 14(13). Lateral eyes on separate tubercles. Tibia I and basitarsus I each with two proventral spiniforms. Carapace setae usually blunt to spatulate . . . *Ozyptila*
 Lateral eyes on a common and usually strongly projecting tubercle. Tibia I and basitarsus I each with more than two proventral spiniforms. Carapace setae bristle-like15
- 15(14). ALE larger than AME. Femora I and II with prodorsal spiniforms as prominent as spiniforms of tibiae I and II or basitarsi I and II . . . *Misumenops*
 ALE and AME subequal in size. Femora I and II with prodorsal spiniforms much less prominent than spiniforms of tibiae I and II or basitarsi I and II. . . .16
- 16(15). Anterior margin of clypeus with a transverse white ridge which at the ends curves caudad and continues into anterior portion of allatum as a longitudinal ridge; seta A2 not spiniform *Misumenoides*
 Carapace without such a ridge; seta A2 spiniform *Misumena*

SUBFAMILY PHILODROMINAE

Philodrominae THORELL, 1870, pp. 173-174.

Body clothed with recumbent, scalelike, or plumose setae (in addition to erect setiforms). Carapace setae C6, 7, 8, P2, and S2 characteristic principal setae; T3 not prominent; A5 directed cephalad. All legs usually similar in length, leg II in some cases markedly

longer than other legs; plantar surface of telotarsi and in some cases basitarsi densely scopulate, scopulae comprising tenent and pectinate setae; claw tuft comprising densely packed tenent setae. Male palpus: Embolus simple, spinelike (connate type); conductor present; reservoir of receptaculum seminis of relatively small diameter, with three loops, gradually decreasing in diameter apicad so that reservoir and ejaculatory duct not sharply delimited. Tutaculum not present. Epigynum: Epigynal suture present. Receptaculum: Spermathecal apodeme developed along entire length of receptaculum.

TRIBE PHILODROMINI, NEW TRIBE

Posterior eye recurvature index only slightly greater than 1.0 at most; posterior median eye interdistance index 1.2-2.0. Male palpus: PCA present in most groups; tegular suture present. VTA variable. Receptaculum: Elongate duct of spermathecal organ usually not present.

GENUS PHILODROMUS WALCKENAER

Philodromus WALCKENAER, 1824, p. 86. DONDALE, 1961, p. 199; MS, p. 1.

Philodromoides SCHEFFER, 1904, p. 303. Synonymy by Gertsch (*in litt.*)

Tibellomimus GERTSCH, 1933b. Synonymy by Roewer, 1954.

TYPES: Of *Philodromus*, *Araneus aureolus* Clerck, 1758. Of *Philodromoides*, *Philodromoides pratariae* Scheffer, 1904. Of *Tibellomimus*, *Philodromus bilineatus* Bryant, 1933.

AME usually subequal in size to ALE, in some cases larger; PME closer to ALE than to PLE. Femur II length index 1.1-1.5 (females); tarsal scopulation usually sparse; proventral spiniform 2 of basitarsus I situated in distal half of segment; basitarsus I typically with two proapical spiniforms, less commonly with one or none. Abdomen usually bilaterally humped caudolaterally. Male palpus: Embolus compressed only apically if at all; PCA absent only in subgenus *Philodromoides*; apical arm of middle loop of reservoir not markedly shorter than basal arm (fig. 26 shows extreme). VTA not contiguous with RTA (except in subgenus *Philodromoides*). Epigynum: Epigynal suture extensively developed along ventral face of epigynum.

TABLE 4
A MORPHOLOGICAL COMPARISON OF THE GENERA OF THE PHILODROMINI

	<i>Philodromus</i>	<i>Rhysodromus</i>	<i>Ebo</i>
AME size	Usually subequal to ALE, in some cases larger	Usually subequal to ALE, in some cases larger	Larger than ALE
PME placement	Closer to ALE than to PLE	Closer to PLE than to ALE, or eyes equidistant	Closer to PLE than to ALE, or eyes equidistant
Abdomen	Usually bilaterally humped or angulate caudolaterally, in some cases evenly rounded	Evenly rounded	Evenly rounded
Basal spiniform 2 placement	In distal half of segment	Typically in basal half of segment	In distal half of segment
Basitarsal proapical spiniforms	Usually 2, in some cases 1 or 0	1	1 or 0
Tarsal scopulation	Relatively sparse	Dense	Dense, except in subgenus <i>Ebo</i>
Male palpus Conductor	Produced prolaterad or distad	Produced distad	A shallow and usually retrolateral groove on tegulum
PCA	Usually present	Present	Absent
VTA	Typically broadly separated from RTA	Apparent homologue to <i>Philodromus</i> type adjacent to RTA	Adjacent to RTA

Philodromus is contrasted to the other genera of the Philodromini in table 4.

The genus *Philodromus* of previous authors consists of five well-defined groups in the Nearctic Region which may be represented by the following species: (1) *pernix* Blackwall, (2) *rufus* Walckenaer, (3) *infuscatus* Keyserling, (4) *virescens* Thorell, and (5) *alascensis* Keyserling. These groups are united apparently by only two characters, the widely spaced PME and the presence of a PCA upon the male genital bulb. However, the first character is also shared by *Ebo* of this tribe, and the second may not be of generic caliber, since the homologies of the PCA are not certain. A more adequate system of classification seems to be the restriction of the groups represented by *pernix*, *rufus*, and *infuscatus* to *Philodromus* and those represented by *virescens* and *alascensis* to a separate genus, here named *Rhysodromus*. The data in table 4 provide some justification for this separation; some of the characters indicated not only separate these two genera but

also indicate a closer phyletic relationship of *Rhysodromus* to *Ebo*.

The three groups comprising the Nearctic segment of *Philodromus* are treated as subgenera here, *pernix* and its allies as the subgenus *Philodromus*, *rufus* and its allies as the subgenus *Tibellomimus* Gertsch, and *infuscatus* and its allies as the subgenus *Philodromoides* Scheffer. The subgenera *Philodromus* and *Tibellomimus* form the core of the genus in the New World. These are more closely related to each other than to *Philodromoides*, as indicated by the presence and similarity in form of the PCA, the presence of a paraembolar apophysis, and other similarities of the male palpus. The male palpus of *Philodromoides* shows little significant similarity to that of these two subgenera aside from the tribal characters. *Philodromoides* is placed in *Philodromus* on the basis of eye characters and the bilateral humping of the abdomen. Scheffer's criterion for establishing *Philodromoides* as a new genus is the presence of five pairs of proventral tibial spiniforms in the

generotype, *Philodromus pratariae* (Scheffer). This is not a good group character, since it is applicable only to *P. pratariae* and some individuals of *P. (Philodromoides) droseroides* but not to the other members of the group.

KEYS TO THE SPECIES OF *Philodromus*
IN CALIFORNIA

Males¹

1. RTA with a prolateral division broadly joined to VTA (subgenus *Philodromoides*; as in fig. 70) 2
- RTA not conjoined with VTA 5
- 2(1). Abdomen homogeneously colored, entirely white or reddish, unmarked . . 3
- Abdomen with distinct markings . . . 4
- 3(2). Abdomen white, dorsally with conspicuous dark spiniforms; legs white, with a dorsal and ventral stripe *droseroides*
- Entire body reddish, abdomen lacking distinct dorsal spiniforms. Legs unmarked *verityi*
- 4(2). Embolus short, not reaching conductor (fig. 73); main body of RTA narrow, elongate, and distally directed *anomalus*
- Embolus longer, reaching conductor (fig. 70); main body of RTA broad, scoop-like, and produced retrolaterad *infuscatus*
- 5(1). Conductor entirely membranous (as in fig. 3); VTA entirely sclerotized (subgenus *Philodromus*) 6
- Conductor largely sclerotized, in some cases with a membranous lobe at retrolateral apex (as in fig. 36, c); VTA partly or not sclerotized (subgenus *Tibellomimus*) 11
- 6(5). PCA very short, about one-seventeenth of width of palpus at same level (fig. 35); VTA broader than RTA, with a robust and blunt, ventrally directed ITA conjoined at its base (fig. 34; *aureolus* group) *cespitum*
- PCA longer, at least one-sixth of width of palpus at same level; VTA narrower than RTA, without a conjoined ITA 7
- 7(6). VTA with a slender, retrolateral, apical apophysis (as in fig. 26); ITA usually distinct; dorsal tooth of RTA elongate, curved, and slender (figs. 27, 33; *pernix* group) 8
- VTA without an apical apophysis; ITA not developed; dorsal tooth of RTA not elongate (*spectabilis* group) 9
- 8(7). Embolus with an elongate ectal emargination about as long as one-fifth of length of embolus (emargination measured from its base to apex of embolus; fig. 32); dorsal tooth of RTA long, hook-shaped (fig. 33) *agrestes*
- Embolus with an elongate ectal emargination about as wide as one-third of length of embolus (emargination measured from its base to apex of embolus; fig. 26); dorsal tooth of RTA shorter, only slightly curved (fig. 27) *californicus*
- 9(7). Carapace and dorsum of abdomen not concolorous, scalation predominantly white. Allatal stripe usually broader than PME interdistance . . . *spectabilis*
- Carapace and dorsum of abdomen almost concolorous, scalation predominantly yellowish to brownish orange. Allatal stripe narrower than PME interdistance. 10
- 10(9). Embolus without an ectal emargination (fig. 23). Abdomen with distinct paramedial and ventrolateral dark stripes. *marginellus*
- Embolus with an ectal emargination just apical to swollen basal portion (fig. 14). Abdomen lacking paramedial and ventrolateral stripes . . . *pinyonensis*
- 11(5). Basal portion of embolus, as seen ventrally, projecting beyond level of cymbial margin (figs. 62, 69): middle loop of reservoir open at proximal to retrolateral side of bulb 12
- Basal portion of embolus situated entirely mesial to level of cymbial margin; middle loop of reservoir open at prolateral side of bulb 13
- 12(11). Embolus originating at proximal margin of tegulum basal to 180 degrees; middle loop of reservoir open at retrolateral side of bulb (fig. 69) *insperatus*
- Embolus originating at prolateral margin of tegulum between 180 and 270 degrees; middle loop of reservoir open at proximal margin of bulb (fig. 62) *rufus*
- 13(11). Distal tooth of RTA terminating distinctly proximal to level of VTA apex (fig. 55), or RTA with a small additional tooth at ventral base of distal tooth (fig. 61). Legs lacking bands and stripes . 14
- Distal tooth of RTA terminating near or beyond level of VTA apex; RTA lacking an additional tooth at base of distal

¹ The male of *coachellae* is unknown.

- tooth. Legs with bands and stripes, in some cases indistinct15
- 14(13). Embolus straight throughout most of its length (fig. 56); distal tooth of RTA terminating distinctly proximal to level of VTA apex; RTA without a denticle at base of distal tooth (fig. 55)*quercicola*
 Embolus slightly but distinctly curved along entire length (fig. 60); distal tooth of RTA terminating only slightly proximal to level of VTA apex; RTA with a denticle at ventral base of distal tooth (fig. 61)*rodecki*
- 15(13). Distal tooth of RTA terminating distinctly beyond level of VTA apex (as in fig. 48)16
 Distal tooth of RTA terminating from slightly proximal to, to near level of, VTA apex (as in fig. 42)17
- 16(15). Distal tooth of RTA closer to dorsal than to ventral margin of cymbium (fig. 49); tibial length index 5.3-5.9*josemitensis*
 Distal tooth of RTA closer to ventral than to dorsal margin of cymbium (fig. 48); tibial length index 7.2-7.7*gertschi diablai*
- 17(15). Tegulum distinctly angulate at proximal prolateral margin; embolus originating near distal margin of tegulum on prolateral side (fig. 36); paraembolar apophysis extending apically to level of tip of embolus*chamisis*
 Tegulum rounded at proximal prolateral side; embolus originating farther basally; paraembolar apophysis terminating well basal to level of tip of embolus18
- 18(17). Embolus originating on prolateral side of tegulum basal to 270 degrees (fig. 50); distal tooth of RTA broader, axis more strongly curved (fig. 52)*speciosus*
 Embolus originating on prolateral side of tegulum near or apical to 270 degrees; distal tooth of RTA narrower, axis less strongly curved (figs. 44, 42)19
- 19(18). Distal tooth of RTA not distinctly hook-shaped, axis only slightly curved (fig. 44); tibial length index 5.3-5.6. Proventral stripe of femur I solid black, contrasting strongly with rest of segment*orarius*
 Distal tooth of RTA distinctly hook-shaped, axis strongly curved (fig. 42); tibial length index 6.7-7.7. Proventral stripe of femur I not so strongly con-

trasting with rest of segment or stripe not apparent*gertschi gertschi*

Females¹

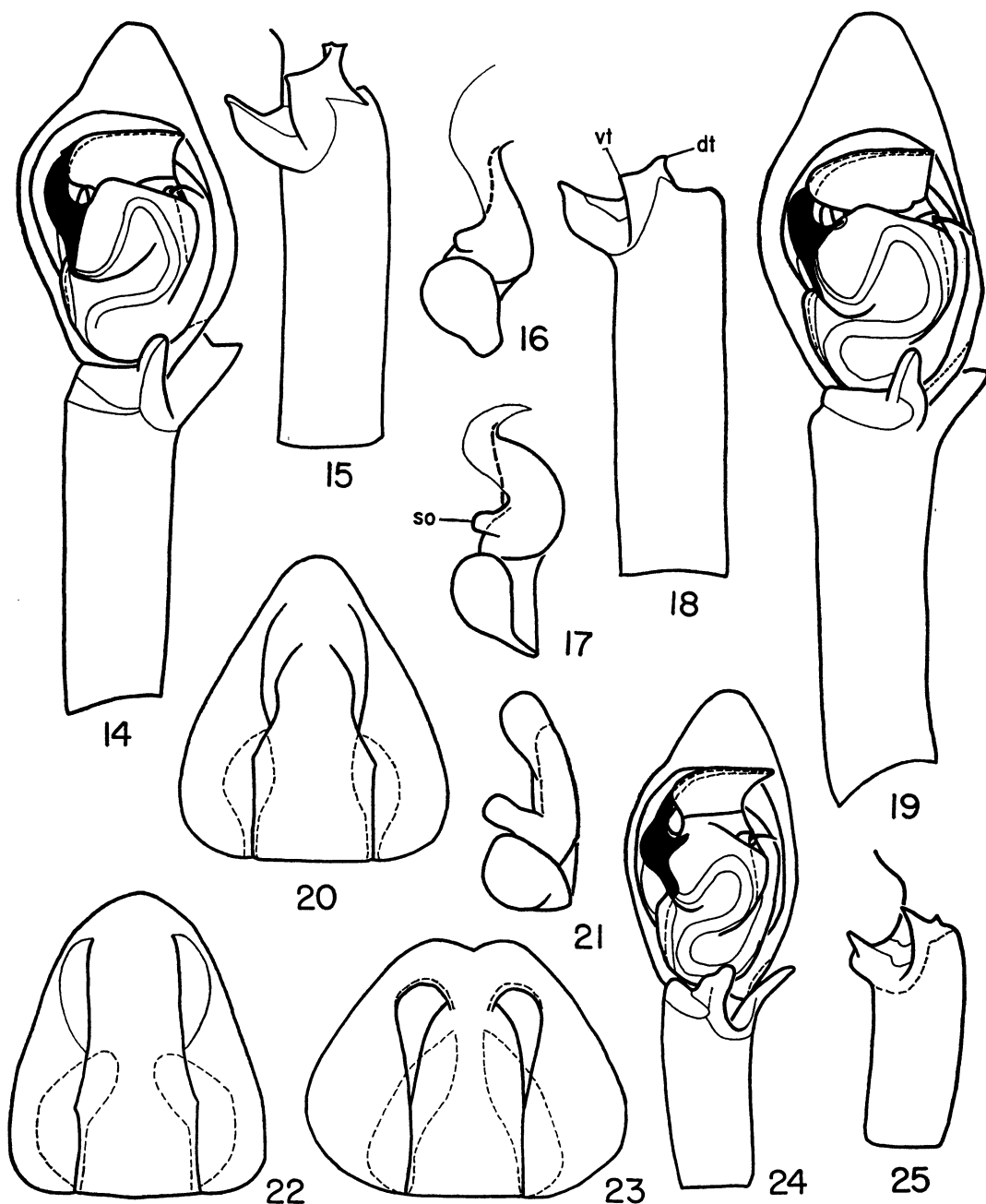
1. Epigynal sutures usually divergent (as in fig. 72). Elongate duct of spermathecal organ present (as in fig. 71). Tibia I usually with three or more proventral spiniforms (subgenus *Philodromoides*)2
 Epigynal sutures usually parallel. Elongate duct of spermathecal organ absent. Tibia I with two proventral spiniforms6
- 2(1). Abdomen homogeneously white or reddish. Femur I with or without spiniforms3
 Abdomen with distinct markings. Femur I with spiniforms.4
- 3(2). Abdomen white, with conspicuous, dark, dorsal, capitate spiniforms. Legs white, with a dorsal and a ventral dark stripe*droseroides*
 Entire body reddish, abdomen lacking distinct dorsal spiniforms. Legs unmarked*verityi*
- 4(2). Tibia I with one prolateral and two proventral spiniforms (1-2-0). Duct of spermathecal organ, as seen through epigynal integument, with axis sagittal to oblique (fig. 75)*anomalus*
 Tibia I with three, less usually two, prolateral and proventral spiniforms (3-3-0 to 2-2-0). Duct of spermathecal organ, as seen through integument, with axis transverse at least in basal portion (as in fig. 72)5
- 5(4). Duct of spermathecal organ (visible through epigynal integument) slender, broadly curving cephalad in distal portion, spermathecal organ about twice diameter of canal (fig. 76)*coachellae*
 Duct of spermathecal organ (visible through epigynal integument) stout, not markedly curving cephalad, spermathecal organ less than twice diameter of canal (fig. 72)*infuscatus*
- 6(1). Abdomen usually angulate caudolaterally, or, if rounded, legs lacking bands and maculae and basitarsus I with only one proapical spiniform or none (subgenus *Tibellomimus*)7
 Abdomen usually evenly rounded caudolaterally. Legs in almost all cases banded; basitarsus I with two pro-

¹ The female of *agreutes* is unknown.

- apical spiniforms (subgenus *Philodromus*) 15
- 7(6). Abdomen evenly rounded caudolaterally 8
- Abdomen angulate caudolaterally 10
- 8(7). Spermatheca (visible through epigynal integument) with a narrow, tubular, anterior extension curving laterad (fig. 64) *rufus*
- Spermatheca of different form 9
- 9(8). Dorsum of abdomen with reddish brown scalation and a white mediolongitudinal stripe. Median septum of epigynum strongly constricted cephalad (fig. 59) *rodecki*
- Dorsum of abdomen white. Sides of median septum nearly parallel (fig. 57) *quercicola*
- 10(7). Legs lacking distinct bands or stripes. Dorsum of abdomen white, lacking dark middorsal markings but with a strongly contrasting, dark, laterocaudal area extending dorsomesiad from lateral stripe. Lateral atrium of epigynum produced beneath median septum (fig. 67) *insperatus*
- Legs with bands and stripes variously reduced. Dorsum of abdomen seldom white and usually lacking dark middorsal markings. Lateral atrium usually not produced beneath median septum 11
- 11(10). Dorsum of abdomen white, with strongly contrasting, narrow, paramedial stripes distinct from lateral stripes, with fusiform spiniforms. Lateral atrium of epigynum a discrete although somewhat indistinct elliptical depression (fig. 39) *chamisis*
- Dorsum of abdomen white to purplish, with setaceous spiniforms, paramedial stripes often indistinctly delimited, conjoined with other dorsal abdominal markings. Lateral atrium of epigynum very shallow, not delimited from remainder of epigynum or only at lateral margin 12
- 12(11). Spermatheca (visible through epigynal integument) apparently curved laterad at anterior end (fig. 53) *speciosus*
- Anterior end of spermatheca not curved 13
- 13(12). Spermathecae (visible through epigynal integument) typically small and relatively broadly separated from each other (fig. 41), not convoluted (requires dissection; fig. 40) *orarius*
- Spermathecae larger and more closely approximated (fig. 47), with a spiral convolution (requires dissection; fig. 43) 14
- 14(13). Legs pale, ivory, or yellowish, with strongly contrasting dorsal maculae; bands and a blackish proventral stripe present on femur I *josemitensis*
- Legs pale to moderate brown, markings not so distinct; venter of femur I usually purplish, bands indistinct *gertschi gertschi*; *g. diablae*
- 15(6). Median septum not present; anterior margin of central division sharply defined as a curved convex ridge; atrium single, medial (fig. 30) *cespitem*
- Median septum present, sclerotized; anterior end of central division not as above; bilateral atria present, in some cases conjoined cephalad (fig. 20) 16
- 16(15). Carapace and abdomen nearly concolorous, covered by a dense vestiture of yellowish to brownish orange scales 17
- Carapace and abdomen not concolorous, scalation mainly white, although dorsum of abdomen infrequently invested extensively with bronze-colored scales 18
- 17(16). Abdomen with dark, distinct, paramedial, and ventrolateral stripes. Lateral atria of epigynum not conjoined (fig. 23) *marginellus*
- Abdomen without paramedial and ventrolateral stripes. Lateral atria of epigynum conjoined cephalad (fig. 20) *pinyonensis*
- 18(16). Paramedial stripes of abdomen not connected to each other by transverse bands, except in some cases at anterior end. Median longitudinal carina usually developed at anterior end of median septum (fig. 28) *californicus*
- Paramedial stripes of abdomen connected to each other by transverse bands. Median carina not present (fig. 22) *spectabilis*

SUBGENUS **PHILODROMUS** WALCKENAER

Venter of femora III and IV lacking modified setal vestiture. Male palpus: Embolus often emarginate or with protuberances, compressed apically; paraembolar apophysis present in few species; conductor a prominent distal membranous lobe; PCA slender, clawlike, originating in a membranous area; VBA usually thin; dorsal distal portion of tegulum forming a prolaterally directed, broadly



FIGS. 14–16. *Philodromus pinyonelis*, new species. 14. Male palpus, ventral view. 15. Tibia of male palpus, retrolateral view. 16. Receptaculum, dorsal view.

FIGS. 17–19. *Philodromus spectabilis* Keyserling. 17. Receptaculum, dorsal view. 18. Tibia of male palpus, retrolateral view. 19. Male palpus, ventral view.

FIG. 20. *Philodromus pinyonelis*, new species, epigynum.

FIG. 21. *Philodromus marginellus* Banks, receptaculum, dorsal view.

FIG. 22. *Philodromus spectabilis* Keyserling, epigynum.

FIGS. 23–25. *Philodromus marginellus* Banks. 23. Epigynum. 24. Male palpus, ventral view. 25. Tibia of male palpus, retrolateral view.

Abbreviations: dt, dorsal tooth of RTA; so, spermathecal organ; vt, ventral tooth of RTA.

rounded apophysis (fig. 26, A); subtegulum not prominent in unexpanded bulb. Tibia longer than broad; VTA strongly sclerotized; RTA simple, usually with a dorsal and a ventral tooth. Receptaculum: Bursa copulatrix typically heavily sclerotized, bearing spermathecal organ; torus present on spermatheca; elongate duct of spermathecal organ absent.

Four Nearctic groups can be recognized in the subgenus *Philodromus*: *spectabilis*, *pernix*, *aureolus*, and *laticeps*. Only the last-named is not represented in California. The *spectabilis* and *pernix* groups are closely related and more typical of the subgenus than the others. The relationship of the *aureolus* and *laticeps* groups is indicated by a similar type of VTA and RTA.

The subgenus *Philodromus* has recently been revised by Dondale (1961) under the appellation "*aureolus* group." It should be noted that the group taxon of Dondale is much broader than that of the present paper.

Spectabilis GROUP

Male palpus: Embolus abruptly compressed in apical portion; paraembolar apophysis present in some species; a membranous area at base of embolus weakly developed; length of PCA equal to about one-sixth of width of palpus at same level; apex of middle loop of reservoir not reaching distal margin of tegulum. VTA lacking distal spine; dorsal tooth of RTA shorter than that in *pernix* group. Cymbium and tibia subequal in length or tibia longer. Epigynum: Atria bilateral; median septum present, anterior margin obscure. Receptaculum: Bursa copulatrix with a helical convolution.

The *spectabilis* group includes *Philodromus spectabilis* Keyserling, *P. pinyonensis*, new species, *P. marginellus* Banks from California, and *P. keyserlingi* Banks from eastern North America.

Philodromus (*Philodromus*) *spectabilis* Keyserling

Philodromus spectabilis KEYSERLING, 1880, pp. 210-211, pl. 5, fig. 15. DONDALE, 1961, p. 214.

FEMALE: Average length about 6.0 mm.

General coloration white in life, purplish to brown in alcohol. Carapace with white scales; allatal stripe broad, usually broader than PME interdistance, moderate to dark brown,

in some cases purplish; frontal spiniforms usually dark basally and pale apically. Legs pale, ivory-colored to yellowish, with spots and usually banded; femur II length index 1.4-1.5. Dorsum of abdomen generally covered by white scales but patches of bronze-colored scales also present; background coloration usually pale to moderately dark purple; cardiac mark distinct; paramedial stripes closely approximated, separated by a distance about equal to their width, not markedly convergent caudally, connected by a series of bands; lateral stripe broad, comprising irregular markings. Dorsal abdominal markings in some cases very pale, and bronze-colored patches more extensively developed than usual.

Epigynum (fig. 22): Median septum lacking a median carina; lateral atria indistinctly delimited from remainder of epigynum, narrowly connected cephalad or separate, shallow, from an internal view tapering cephalad (fig. 17).

Receptaculum as shown in figure 17.

MALE: Average length about 4.5 mm.

Markings and coloration similar to those of female, but dorsum of abdomen darker, markings often obscure, and bronze-colored scales not so darkly pigmented.

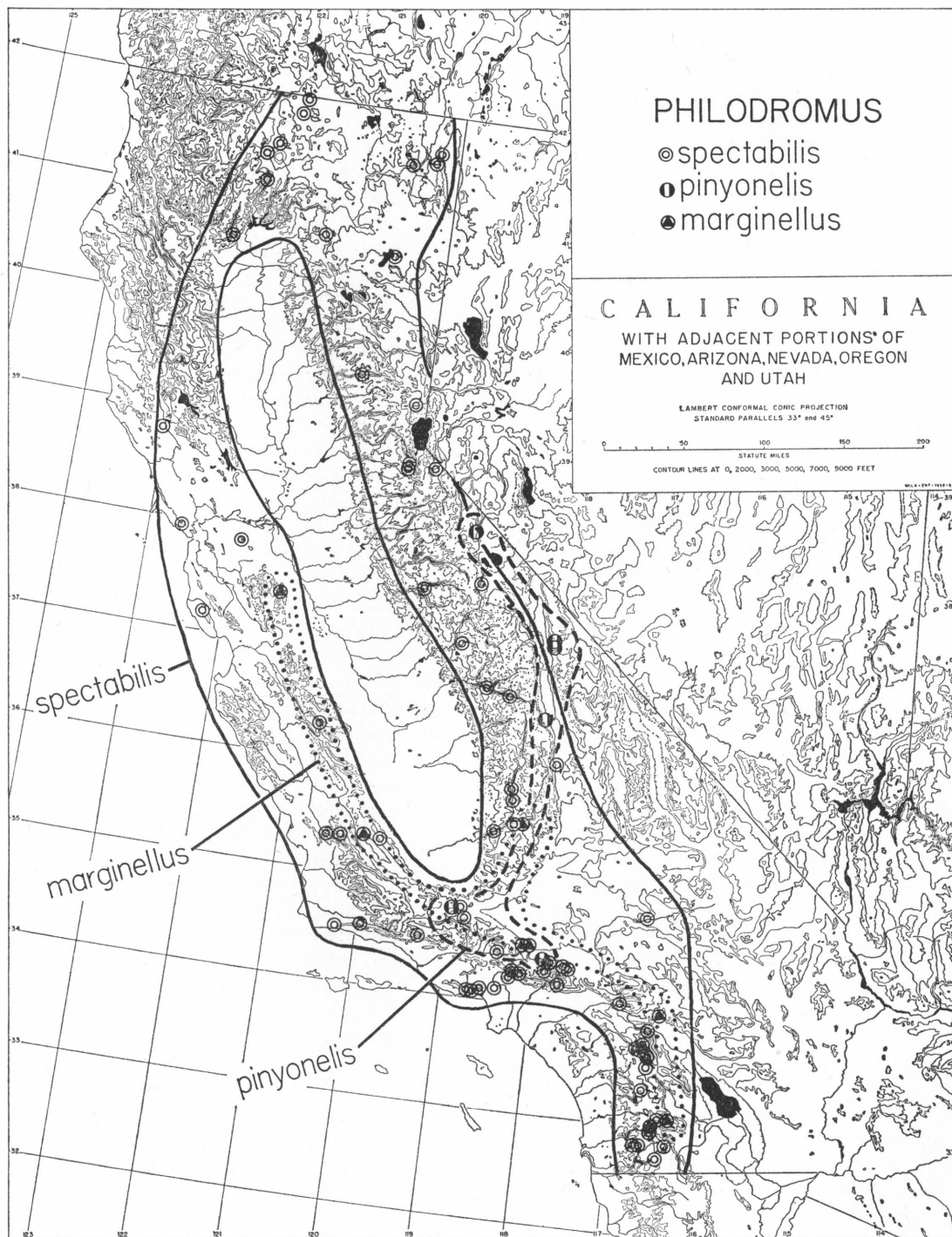
Palpus (figs. 18, 19): Embolus, just apical to broad basal portion, lacking an ectal emargination; paraembolar apophysis present. Dorsal tooth of RTA subequal in size to, and terminating farther distad than, ventral tooth; ventral tooth of RTA acute, lacking small apical denticles.

DEVIATE: Female (Olancho, Inyo County): Body and legs white, allatal stripes, leg markings, and dorsal abdominal markings lacking. Dorsum of abdomen with patches and rows of golden scales.

TYPE: Holotype, male, Colorado (Simon collection, Museum National d'Histoire Naturelle, Paris).

DISTRIBUTION: "New Mexico and Arizona north to Montana, Washington and Vancouver Island" (Dondale, 1961). The distribution in California is indicated in map 4.

SEASONAL DATA: Mature males have been taken from April through July; females, from May through August. Peak abundance appears to occur during June and July. Laboratory-reared specimens have molted to ma-



MAP 4. Distributions of *Philodromus spectabilis* Keyserling, *P. pinyonensis*, new species, and *P. marginellus* Banks.

turity throughout the year. The majority of individuals taken from late summer to early winter matured from January through May without showing a pronounced diapause.

***Philodromus (Philodromus) pinyonelis*,
new species**

FEMALE: Average length 5.0–5.5 mm.

General coloration yellowish to reddish orange in life and in alcohol. Carapace with yellowish to reddish orange scales and less obvious white ones; allatal stripe narrow, narrower than PME interdistance or stripe not present; frontal spiniforms homogeneously pigmented. Legs pale orange, with darker bands; femur II length index 1.2–1.3. Dorsum of abdomen with a dense vestiture of orange scales, in life with contrasting white markings comprising white scales, a broad white anteriomedial stripe, and a pair of bilateral, broad, white transverse bands extending laterad and narrower oblique stripes radiating laterocaudad from cardiac mark, in alcohol with less apparent areas of white scales; cardiac mark distinct; paramedial and lateral stripes not present.

Epigynum (fig. 20): Median septum lacking a median carina; lateral atria indistinctly delimited from remainder of epigynum, broadly connected anteriorly, shallow, from an internal view proximal margin indistinct (fig. 16).

Receptaculum as shown in figure 16.

MALE: Average length about 4.5 mm.

Markings and coloration similar to those of female, but lateral abdominal stripe may be developed.

Palpus (figs. 14, 15): Embolus, just apical to broad basal portion, with an ectal emargination; paraembolar apophysis present. Dorsal tooth of RTA larger and terminating farther distally than ventral tooth; ventral tooth of RTA usually with small denticles at apex.

TYPE: Holotype, male, from Frazer Park (1 mile west), Kern County, California, collected May 18, 1958 (maturation date in laboratory, May 23, 1958), R. X. Schick and David Verity, in the American Museum of Natural History.

DISTRIBUTION: California (map 4); Nevada.

ECOLOGY: This species has been collected only in Pinyon-Juniper Woodland and shows

a marked preference for pinyon-pine, *Pinus monophylla* Torrey and Frémont, but also has been found on *Juniperus* spp.

SEASONAL DATA: Only one specimen has been taken mature in nature, a female in June. Laboratory-reared specimens have matured from April through June, the majority in May. One reared male underwent a brief diapause from February through May before the imaginal molt.

***Philodromus (Philodromus)*
marginellus Banks**

Philodromus marginellus BANKS, 1901, p. 586.

FEMALE: Average length 5.0–6.0 mm.

General coloration usually orange in life and in alcohol. Carapace with dense vestiture of orange scales; allatal stripe narrower than PME interdistance except at ends; frontal spiniforms homogeneously pigmented. Legs orange, with purplish bands and spots; femur II length index 1.2–1.3. Dorsum of abdomen generally covered by orange scales slightly paler than those of carapace; cardiac mark distinct; paramedial stripes separated cephalad by a distance about equal to PME interdistance, distinctly converging caudad, not connected by a series of bands (although a single anterior band may be present); lateral stripe narrow and sinuous, forming a large anterior laterodorsal loop which encloses an area of pink scales, but this part of stripe in some instances not developed, in which case the area of pinkish scales is not bordered; a broad ventrolateral stripe present, continuous cephalad with a large dark area at anterior end of abdomen, and, by means of a vertical band, joined with lateral stripe in caudal half of abdomen.

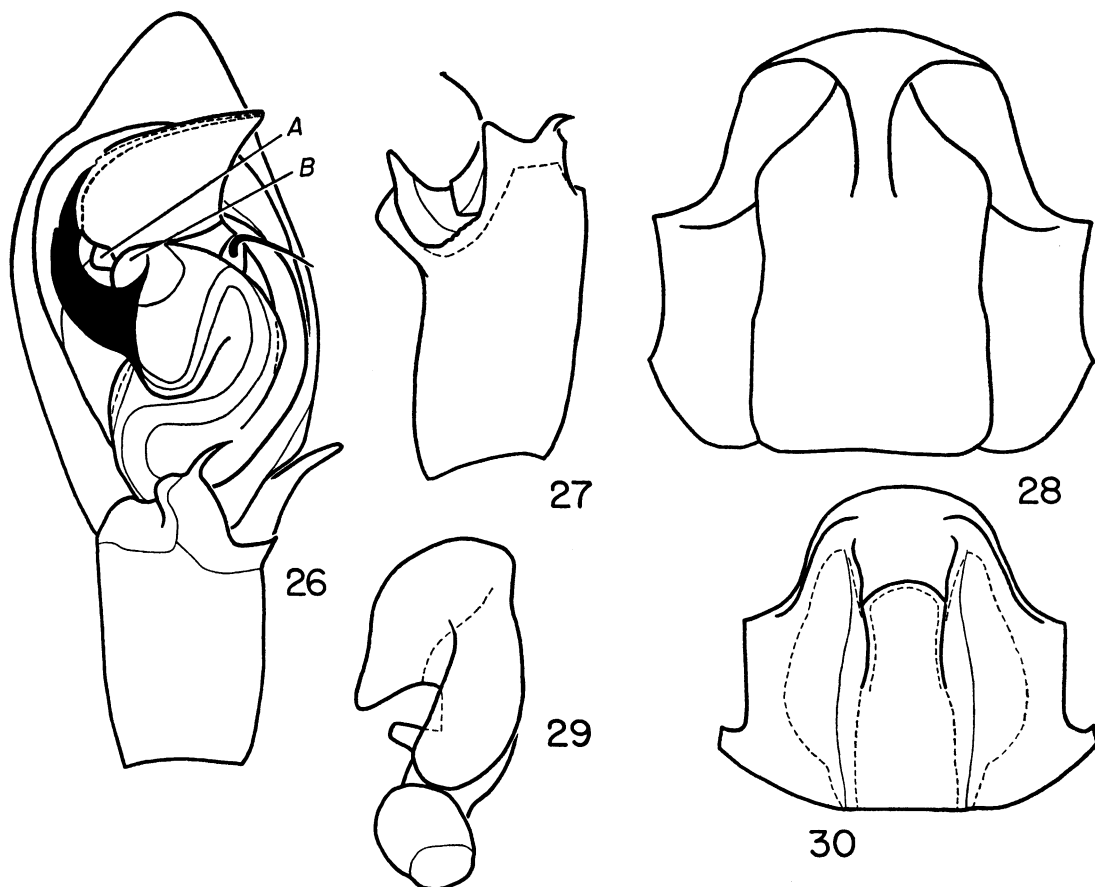
Epigynum (fig. 23): Median septum with a short, anterior, median carina; lateral atria distinctly delimited from remainder of epigynum, separate, deep, from an internal view broadly rounded cephalad (fig. 21).

Receptaculum as shown in figure 21.

MALE: Average length about 4.0 mm.

Markings and coloration similar to those of female, but paramedial stripes of abdomen in some connected by several transverse bands.

Palpus (figs. 24, 25): Embolus, just apical to broad basal portion, lacking an ectal emargination; paraembolar apophysis absent. Dorsal tooth of RTA smaller and termi-



FIGS. 26–29. *Philodromus californicus* Keyserling. 26. Male palpus, ventral view. 27. Tibia of male palpus, retrolateral view. 28. Epigynum. 29. Receptaculum, dorsal view.

FIG. 30. *Philodromus cespitus* (Walckenaer), epigynum.

Abbreviations: A, an apophysis of the tegulum; B, a membranous area.

nating farther proximally than ventral tooth; ventral tooth of RTA in some cases with small denticles at apex.

DEVIATE: Male, reared (Diablo Range, west of Patterson, Stanislaus County): Carapace scales dark gray, dorsal abdominal scales pale yellow.

TYPE: Holotype, female, Santa Rita Mountains, Arizona, June (U.S.N.M. No. 5429).

DISTRIBUTION: California (map 4); Arizona.

ECOLOGY: Specimens have been taken only on California juniper, *Juniperus californica* Carrière, in areas devoid of *Pinus monophylla* Torrey and Frémont.

SEASONAL DATA: Mature forms have been collected from May through July. Labora-

tory-reared specimens have matured in May and June, the majority in May.

Pernix GROUP

Male palpus: Embolus becoming gradually compressed apicad, with a broad ectal emargination; paraembolar apophysis not present; a membranous area at base of embolus strongly developed (fig. 26, B); length of PCA equal to about one-fourth of width of palpus at same level; apex of middle loop of reservoir reaching distiretrolateral margin of tegulum. VTA with a prominent distal spine; ITA present, independent of VTA or RTA; dorsal tooth of RTA long. Cymbium at least twice length of tibia. Epigynum: Atria bilateral; median septum present, anterior

margin obscure. Receptaculum: Bursa copulatrix with a helical convolution.

The *pernix* group includes *Philodromus californicus* Keyserling and *P. agreutes*, new species, from California, and *P. pernix* Blackwall, *P. praelustris* Keyserling, and *P. vulgaris* Hentz from other parts of North America.

***Philodromus (Philodromus)*
californicus Keyserling**

Philodromus californicus KEYSERLING, 1884, pp. 30–31, pl. 21, fig. 24. DONDALE, 1961, p. 213.

FEMALE: Average length about 7.5 mm.

Carapace with white scales; allatal stripe broader than PME interdistance, pale to dark brown or greenish gray; frontal spiniforms homogeneous in pigmentation. Legs whitish, with or without bands and spots; femur II length index 1.4. Dorsum of abdomen generally covered by white scales but patches of bronze-colored scales also present; cardiac mark distinct; paramedial stripes separated cephalad by a distance about equal to their width, distinctly converging caudad, not connected by transverse bands; lateral stripe present, posterior end visible dorsally.

Epigynum (fig. 28): Median septum very broad, a relatively elongate anterior carina present; lateral atria deep, distinctly delimited from remainder of epigynum, not confluent, from an internal view broadening cephalad (fig. 29).

Receptaculum as illustrated in figure 29.

MALE: Average length about 6.0 mm.

Markings and coloration similar to those of female, but bronze-colored scales of abdomen not so deeply pigmented.

Palpus (figs. 26, 27): Ectal emargination of embolus about as broad as one-third of length of embolus apical to basal wall of emargination; embolus without a small tooth visible ventrally. Dorsal tooth of RTA moderately long, slightly curved.

DEVIATE: Female, reared (Valyermo, Los Angeles County): Abdominal markings obscure, dorsum of abdomen with intermixed white and orange scales.

TYPE: Holotype, female*, San Francisco, California (U.S.N.M. No. 1619).

DISTRIBUTION: "California and Oregon, inland to Arizona and Colorado" (Dondale, 1961). The distribution in California is shown

in map 5.

ECOLOGY: *Californicus* has been collected personally only in the San Diegan District, but there solely on trees, primarily on oak in oak woodlands.

SEASONAL DATA: Mature males have been taken in April; females, from April through July. One immature female, taken in September, matured in December after four molts.

***Philodromus (Philodromus)* *agreutes*,
new species**

FEMALE: Unknown.

MALE: Average length about 5.5 mm.

Three males (Bridgeport, Mono County): Markings and coloration similar to those of *P. californicus*. Allatal stripes narrower and darker than those of holotype specimen, dorsum of abdomen whitish, with distinct black paramedial stripes. Holotype male: Dorsum of abdomen dark reddish purple, paramedial stripes obscure. These four males are the only known specimens of this species.

Palpus (figs. 32, 33): Ectal emargination of embolus about as broad as one-fifth of length of embolus apical to basal wall of emargination; embolus with a small dorsal tooth (opposite emargination) visible ventrally.

Dorsal tooth of RTA very elongate, strongly curved.

TYPE: Holotype, male, Eagle Lake, northwest shore on Susanville–Adin road, Lassen County, California, June 20, 1958 (maturation date in laboratory, June 23, 1958), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 5).

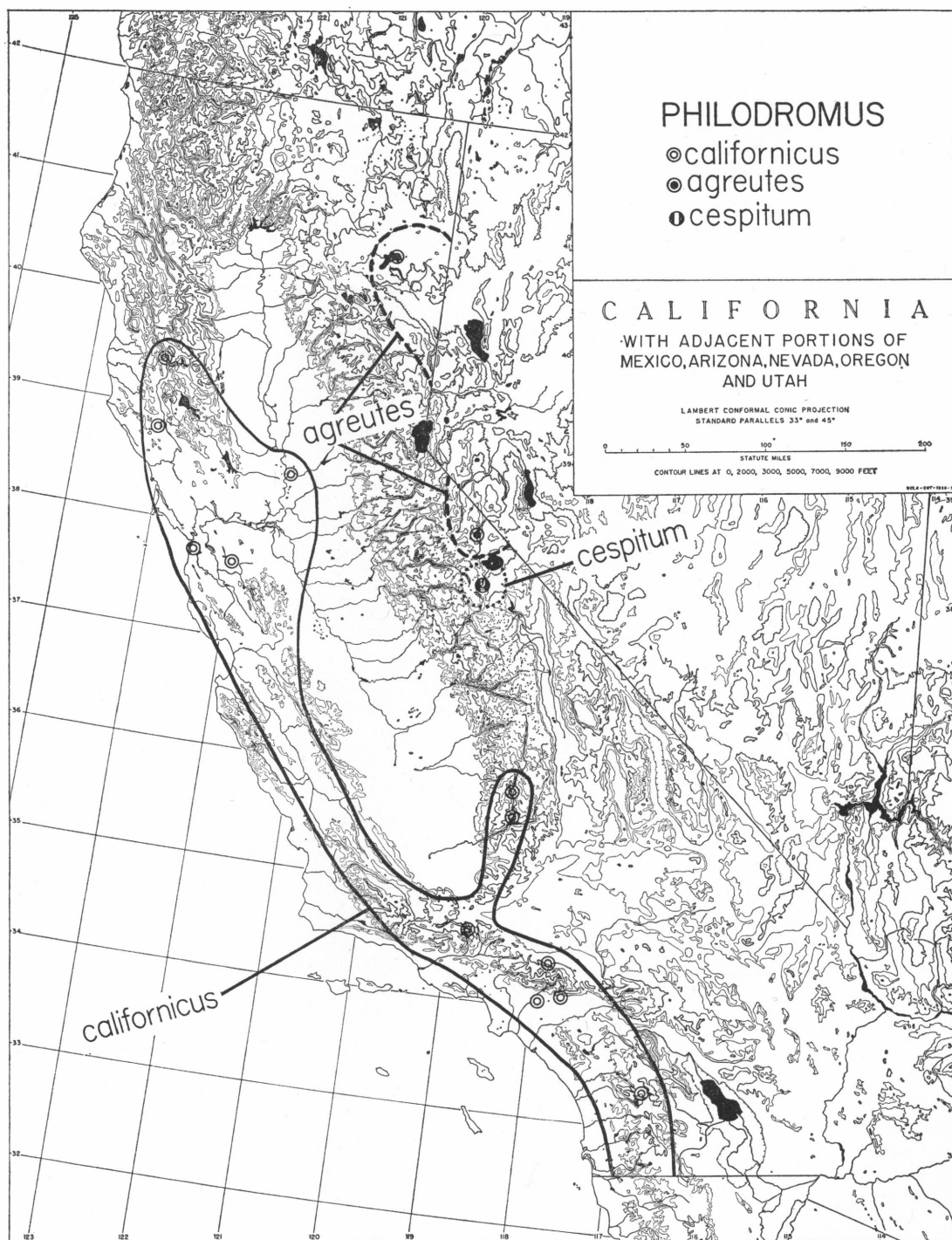
ECOLOGY: The three males of the collection from Bridgeport, Mono County, were taken on the ceiling of a hotel at night near lights. The holotype male was collected on juniper.

SEASONAL DATA: The Bridgeport males were taken in June.

REMARKS: The specific name of the species is derived from the Greek *agreutes*, meaning "hunter" (Brown, 1956).

Aureolus GROUP

Male palpus: Embolus becoming gradually compressed apicad, with a thin, re-



MAP 5. Distributions of *Philodromus californicus* Keyserling, *P. agreutes*, new species, and *P. cespitum* Walckenaer.

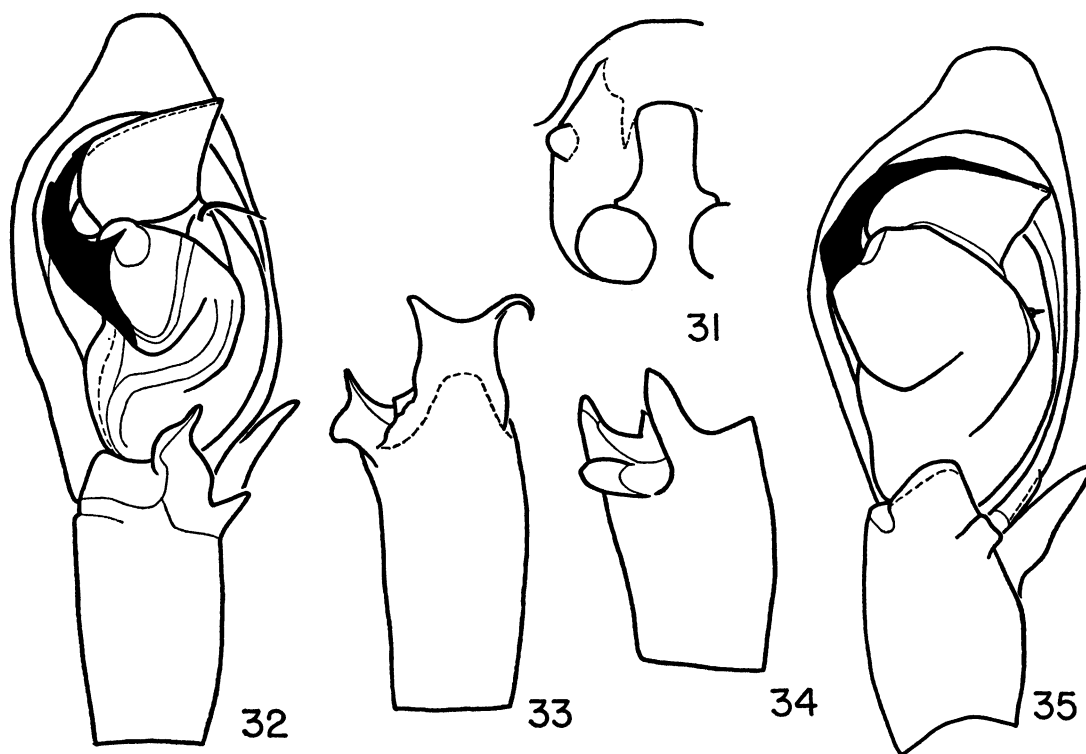


FIG. 31. *Philodromus cespitus* (Walckenaer), receptaculum, dorsal view.

FIGS. 32, 33. *Philodromus agreutes*, new species. 32. Male palpus, ventral view. 33. Tibia of male palpus, retrolateral view.

FIGS. 34, 35. *Philodromus cespitus* (Walckenaer). 34. Tibia of male palpus, retrolateral view. 35. Male palpus, ventral view.

flected, ectal flange near base; paraembolar apophysis not present; a membranous area at base of embolus weakly developed; length of PCA equal to about one-seventeenth of width of palpus at same level; apex of middle loop of reservoir not reaching distal margin of tegulum. VTA lacking distal spine; ITA present, associated with VTA; RTA lacking dorsal tooth. Cymbium nearly twice length of tibia. Epigynum: Atrium single, medial; median septum absent; anterior end of central division distinctly defined. Receptaculum: Bursa copulatrix not convoluted.

According to the data in Dondale (1961), only one species represents the *aureolus* group, as defined here, in the Nearctic Region, *Philodromus cespitum* Walckenaer.

***Philodromus* (*Philodromus*)
cespitum Walckenaer**

Philodromus cespitum WALCKENAER, 1802, vol. 2, p. 230.

Philodromus cespiticolis WALCKENAER, 1837, p. 535. DONDALE, 1961, p. 216.

FEMALE: Average length about 5.5 mm.

Carapace with white scales; allatal stripe broader than PME interdistance, brown; frontal spiniforms homogeneously pigmented. Legs whitish or pale yellowish, with purplish bands; femur II length index 1.2–1.3. Dorsum of abdomen predominantly with white scales, but patches of indistinct yellow scales also present; cardiac mark usually poorly defined; paramedial stripes not developed or obscure; lateral stripe the most obvious abdominal marking.

Epigynum (fig. 30): Distinguished from the other members of the subgenus by the group characters.

Receptaculum as illustrated in figure 31.

MALE: (Based on one specimen from California). Length 4.5 mm.

Legs moderately dark brown, lacking

bands and spots. Dorsum of abdomen with a broad, dark purple, median stripe and some narrow white areas situated between the median and lateral stripes.

Palpus (figs. 34, 35): Distinguished from that of the other members of the subgenus by the group characters.

TYPE: Female holotype of *cespitum* from France.

DISTRIBUTION: Holarctic. "Alaska and District of MacKenzie to Nova Scotia, south in the Rocky Mountains to Arizona and in the eastern mountains to Alabama" (Dondale, 1961). The distribution in California is indicated in map 5.

SEASONAL DATA: Only one collection of this species has been made in California, from the eastern margin of the Sierran District and comprising the male described above (apparently an old individual if one can judge by the very heavily sclerotized bulb and the loss of the embolus on one side) and several females taken in July.

SUBGENUS *TIBELLOMIMUS* GERTSCH

TYPE: *Philodromus bilineatus* Bryant, 1933 (= *Tibellomimus lineatus* Gertsch, 1933).

Venter of femora III and IV lacking modified setal vestiture. Male palpus: Embolus smoothly sculptured, without a discrete compressed portion; paraembolar apophysis present in all species; conductor broadly sclerotized mesially except at retrolateral tip; PCA slender, clawlike, originating in a membranous area; VBA somewhat bulbous; other tegular apophyses lacking; subtegulum not prominent in unexpanded bulb. Tibia longer than broad; VTA membranous; RTA simple, with a single distal tooth. Receptaculum: Bursa copulatrix not apparent in most species (i.e., *speciosus* series), where present membranous and wound about spermatheca; spermatheca bearing both spermathecal organ and torus; elongate duct of spermathecal organ lacking.

The species of *Tibellomimus* from California can be grouped in two series, the *speciosus* series and the *rufus* series.

Speciosus SERIES

Male palpus: Embolus originating only slightly basal to 270 degrees or farther apically (except in the non-Californian *P. oneida*

Levi), base not protruding beyond margin of cymbium (as seen ventrally); paraembolar apophysis length at least two-thirds of that of embolus (Californian forms). Distal tooth of RTA terminating near level of apex of VTA (except in *quercicola*). Receptaculum: Bursa copulatrix not apparent.

Two groups in the *speciosus* series can be recognized in California, the *speciosus* group, a distinct phyletic group, and the *rodecki* group, more a group of convenience.

Speciosus GROUP

Abdomen bilaterally humped (or angulate) caudolaterally. Male palpus: Embolus more slender than that in *rodecki* group. Receptaculum: Torus lateral on spermatheca or not apparent; spermathecal organ lateral or anterior on spermatheca.

Philodromus (Tibellomimus) chamisis, new species

FEMALE: Average length about 3.5 mm.

Allatal stripe dark brown or dark gray to black. Legs with extensive dark markings, dorsum of segments banded, venter entirely dark; femur II length index 1.1–1.3. Dorsum of abdomen generally whitish, markings sharply defined; cardiac mark continuous caudad with paramedial stripes, the latter nearly contiguous; dorsal erect spiniforms fusiform.

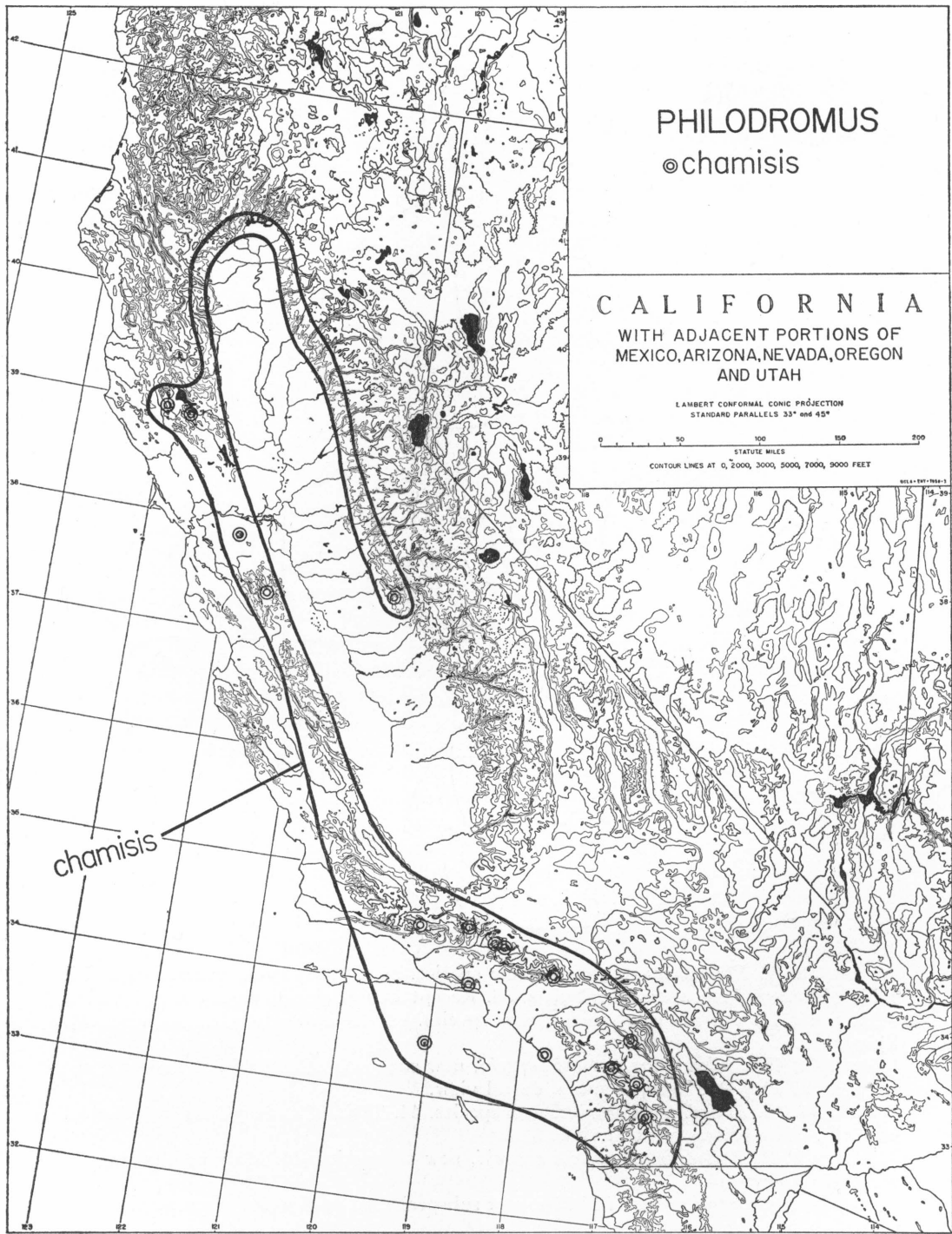
Epigynum (fig. 39): Atria bilateral, membranous depressions in an otherwise sclerotized epigynum, distinctly delimited from rest of epigynum.

Receptaculum (fig. 38): Spermatheca without a convolution, shape as illustrated; torus distinct, lateral in position; spermathecal organ anterior in position.

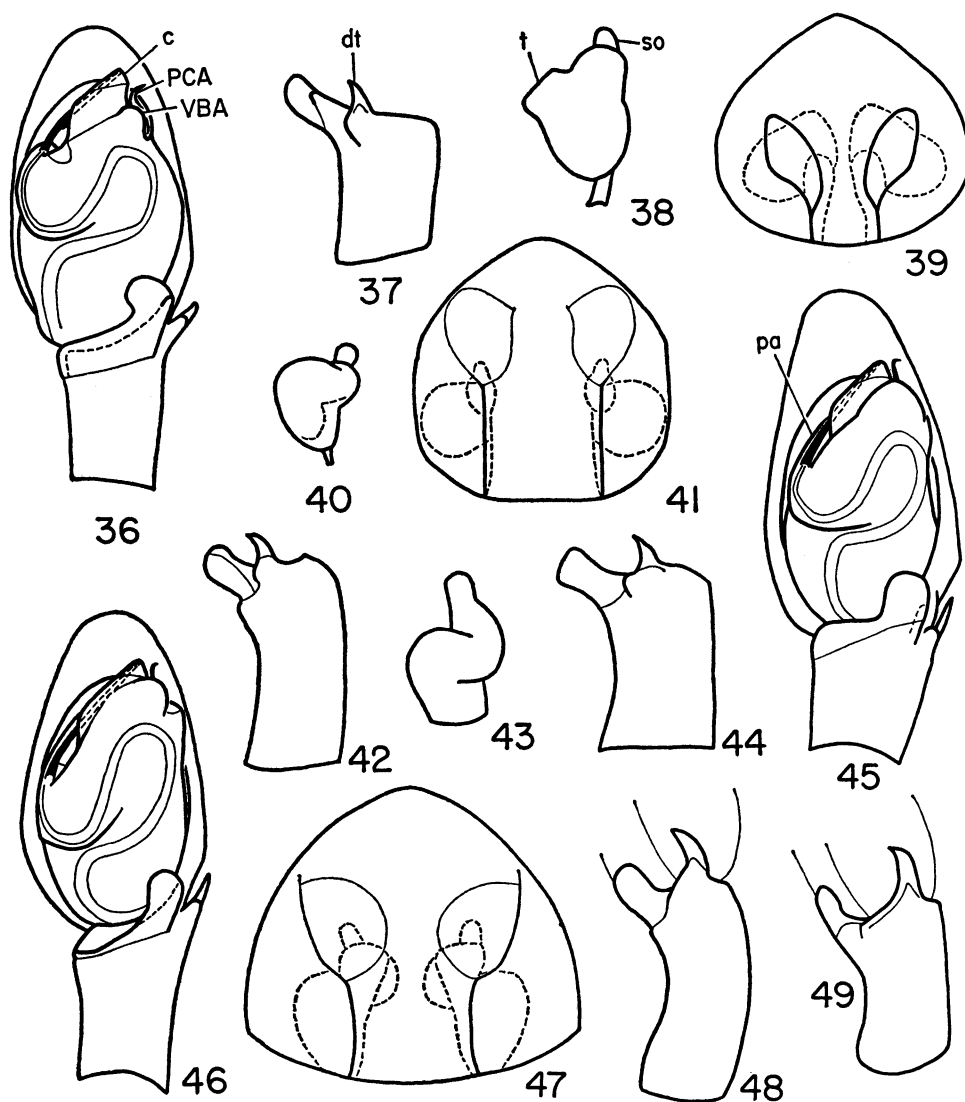
MALE: Average length about 3.0 mm.

Legs paler than those of female, yellowish, markings in some cases not so distinct.

Palpus (figs. 36, 37): Length of bulb 0.36–0.48 mm. Embolus originating near 315 degrees; paraembolar apophysis subequal in length to embolus; PCA only slightly curved; tegulum angulate proximoprolaterally. Length of tibia 0.18–0.24 mm., tibial length index 4.0–5.0; distal tooth of RTA short, evenly and slightly curved, terminating just basal to VTA apex, situated closer to VTA than in *orarius*.



MAP 6. Distribution of *Philodromus chamisis*, new species.



FIGS. 36-39. *Philodromus chamisis*, new species. 36. Male palpus, ventral view. 37. Tibia of male palpus, retrolateral view. 38. Receptaculum, dorsal view. 39. Epigynum.

FIGS. 40, 41. *Philodromus orarius*, new species. 40. Receptaculum, dorsal view. 41. Epigynum.

FIGS. 42, 43. *Philodromus gertschi gertschi*, new subspecies. 42. Tibia of male palpus, retrolateral view. 43. Receptaculum, dorsal view.

FIGS. 44, 45. *Philodromus orarius*, new species. 44. Tibia of male palpus, retrolateral view. 45. Male palpus, ventral view.

FIGS. 46, 47. *Philodromus gertschi gertschi*, new subspecies. 46. Male palpus, ventral view. 47. Epigynum.

FIG. 48. *Philodromus gertschi diablae*, new subspecies, tibia of male palpus, retrolateral view.

FIG. 49. *Philodromus josemitensis* Gertsch, tibia of male palpus, retrolateral view.

Abbreviations: c, conductor; dt, distal tooth of RTA; so, spermathecal organ; t, torus.

DEVIATES: Females, reared (Laguna Beach, Orange County): Allatal stripe light gray. Legs paler than those of forms found in chaparral (described above), lacking distinct bands. Torus of receptaculum small, dome-like.

TYPE: Holotype, male, 10 miles west of Kelseyville on Hopland road, Lake County, California, May 20, 1959, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 6).

ECOLOGY: *Chamisis* has been taken most abundantly in chaparral and shows a decided plant-host preference for chamise (hence the specific name), *Adenostoma fasciculatum* Hooker and Arnott.

SEASONAL DATA: Mature males have been collected in May; mature females, from May through July. Immature males taken from January through April matured in the laboratory from February through April; immature females, in April.

***Philodromus (Tibellomimus) orarius*,
new species**

FEMALE: Average length about 3.5 mm.

Allatal stripe pale, brown or grayish. Legs largely pale, sparsely punctate, often banded; femur I with a strongly contrasting dark brown to black proventral stripe, not so extensively, if at all, developed on femur II; femur II length index 1.4. Dorsum of abdomen pale, yellowish to brown or purplish (usually paler than that in *gertschi* subspp.); paramedial stripes pale and indistinct or dark, in some cases conjoined and forming a transverse caudal band; dorsal erect spiniforms setaceous.

Epigynum (fig. 41): Details of epigynum difficult to discern owing to over-all weak sclerotization. Atria bilateral, indistinctly delimited from remainder of epigynum.

Receptaculum (fig. 40): Spermatheca without a convolution, shape as illustrated, smaller and more widely spaced than that in other species of *Tibellomimus* (visible through epigynal integument); torus not apparent; spermathecal organ anterior in position.

MALE: Average length about 3.0 mm.

Leg markings and coloration like those of female.

Palpus (figs. 44, 45): Length of bulb 0.33–

0.39 mm. Embolus originating between 270 and 315 degrees; paraembolar apophysis length about two-thirds of that of embolus; PCA terminating as a small hook; tegulum evenly rounded proximoprolaterally. Length of tibia 0.21–0.26 mm.; tibial length index 5.3–5.6; distal tooth of RTA short, evenly and slightly curved, terminating at about level of VTA apex, situated farther from VTA than in *chamisis* or *gertschi* subspp.

TYPE: Holotype, male, Malibu, Los Angeles County, California, April 1956, D. C. Blodget, in the American Museum of Natural History.

DISTRIBUTION: California (map 7); Baja California (one record from Puerto Santa Tomas).

ECOLOGY: This species has been collected mainly in Coastal Sage and low-elevation Coastal Oak Woodland, hence the specific name *orarius* (Latin *ora* meaning "coast").

SEASONAL DATA: Mature males have been taken in April and May; females, from April through July. An immature male collected in September and an immature female in October both molted to maturity in January.

***Philodromus (Tibellomimus) gertschi gertschi*,
new subspecies**

FEMALE: Average length about 4.5 mm.

Allatal stripe brown. Legs I and II pale to moderate brown, indistinctly banded; venter of femora I and II usually with a purplish stripe broader than that in *orarius* and *josemi-tensis* but not so strongly contrasting to remainder of segment, or ventral pigmentation reduced; femur II length index 1.4–1.5. Dorsum of abdomen white to purplish; paramedial stripes often conjoined and appearing as a single medial marking; dorsal, erect spiniforms setaceous; dorsum of abdomen, when white, in some cases with a large, black, anteriorly wedgelike marking in caudal half obliterating paramedial stripes.

Epigynum (fig. 47): Atria bilateral, usually at least lateral margin distinct.

Receptaculum (fig. 43): Spermatheca with a single convolution, S-shaped; torus not apparent; spermathecal organ anterior in position.

MALE: Average length about 3.5 mm.

Leg markings and coloration like those of female but darker; proventral stripe of femur



MAP 7. Distributions of *Philodromus orarius*, new species, *P. gertschi gertschi*, new subspecies, *P. g. diablae*, new subspecies, *P. josemitensis* Gertsch, and *P. speciosus* Gertsch.

I, when developed, not so clearly defined nor so sharply contrasting to remainder of segment as in *orarius* and *josemitensis*.

Palpus (figs. 42, 46): Length of bulb 0.39–0.44 mm. Embolus originating just apical to 270 degrees; paraembolar apophysis length about three-fourths of that of embolus; PCA terminating as a small hook; tegulum evenly rounded proximoprolaterally. Length of tibia 0.30–0.36 mm.; tibial length index 6.7–7.7; distal tooth of RTA short, evenly curved, terminating at about level of VTA apex, situated closer to VTA than in *orarius* or *g. diablae*.

TYPE: Holotype, male, 2 miles south of Burnt Rancheria, Laguna Mountains, San Diego County, California, June 15, 1957, D. Verity and R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 7).

SEASONAL DATA: Mature individuals have been taken from May through July, mainly in June. Immatures collected from January through March molted to maturity in the laboratory from February through April, showing no sign of diapause.

***Philodromus (Tibellomimus) gertschi diablae*,
new subspecies**

FEMALE: (Based on one reared specimen). Length 4.5 mm.

Markings and coloration similar to those of form of *g. gertschi* with wedgelike caudal abdominal marking. Femur II length index 1.4.

Epigynum and receptaculum similar to those of *g. gertschi*.

MALE: (Based on two specimens). Length about 3.5 mm.

Palpus (fig. 48): Similar to that of *g. gertschi* but distal tooth of RTA longer, less strongly curved, and terminating distal to apex of VTA and situated farther from VTA, tibia more elongate, length 0.36–0.38 mm. (but tibial length index, 6.7–7.1, in range of that of *g. gertschi*). Length of bulb 0.42–0.44 mm.

TYPE: Holotype, male, Mt. Diablo State Park, Contra Costa County, California, April 30, 1959 (maturation date in laboratory May 9, 1959), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 7).

SEASONAL DATA: Adult males have been taken in May and July. A penultimate male (the holotype) and penultimate female collected in April molted to maturity shortly afterward, in May.

***Philodromus (Tibellomimus)*
josemitensis Gertsch**

Philodromus josemitensis GERTSCH, 1934, pp. 23–24, fig. 24.

FEMALE: Average length about 4.0 mm.

Allatal stripe brown. Legs pale, ivory-colored or yellowish, with distinct dorsal maculae and bands; venter of femur I entirely black, ventral pigmentation of femur II in form of stripe; femur II length index 1.2–1.5. Dorsum of abdomen purplish; paramedial stripes typically conjoined or closely approximated to form a caudal band that extends laterad to lateral stripes; portion of abdomen caudal to band typically set off as distinct pale area; dorsal erect spiniforms setaceous.

Epigynum similar to that of *gertschi* subspp.

Receptaculum similar to that of *gertschi* subspp. but larger in northern forms and in some cases with an anterior torus.

MALE: Average length 3.0–3.5 mm.

Leg markings not so distinct as those of female.

Palpus (fig. 49): Length of bulb 0.40–0.48 mm. Embolus originating near 270 degrees; paraembolar apophysis length about two-thirds of that of embolus; PCA terminating as a small hook; tegulum evenly rounded proximoprolaterally. Length of tibia 0.27–0.33 mm.; tibial length index 5.3–5.9; distal tooth of RTA longest of *speciosus* group, axis erect basally but abruptly curved apically, terminating distal to apex of VTA, situated farther from VTA than in other species of group.

TYPE: Holotype, male*, Yosemite National Park, California, R. F. Sternitzky, in the American Museum of Natural History (probably a spurious record).

DISTRIBUTION: California (map 7); Oregon.

SEASONAL DATA: Mature males have been collected from March through July; females, from May through July.

***Philodromus (Tibellomimus)*
speciosus Gertsch**

Philodromus speciosus GERTSCH, 1934, pp. 22-23, figs. 21, 23.

FEMALE: Average length about 4.5 mm.

Typical forms: Allatal stripe brown. Legs pale, ivory-colored, with brown to purple maculae and bands; proventral stripe of femur I often interrupted in distal one-third, stripe of femur II longer but quite narrow; femur II length index 1.4-1.5. Dorsum of abdomen purple; paramedial stripes distinct, discrete or contiguous (in latter case forming a medial marking as in *gertschi* subsp.); dorsal erect spiniforms setaceous. "White-backed" forms: Differing from typical forms in following respects, allatal stripe coal black and dorsum of abdomen unmarked, uniformly white or pale yellow.

Epigynum (fig. 53): Atrium a broad, single, median depression, lateral margins distinct.

Receptaculum (fig. 51): Spermatheca not convoluted, C-shaped; torus not apparent; spermathecal organ typically anteriolateral in position.

MALE: Average length about 4.0 mm.

Legs darker than those of female; femora I and II with a broad proventral stripe variously reduced.

Palpus (figs. 50, 52): Length of bulb 0.45-0.56 mm. Embolus originating distinctly basal to 270 degrees; paraembolar apophysis length about three-fourths of that of embolus; PCA terminating as a small hook; proximoprolateral margin of tegulum evenly rounded. Length of tibia 0.36-0.46 mm.; tibial length index 6.7; distal tooth of RTA broadest of *speciosus* group, sharply inclined at about longitudinal midpoint, terminating distal to apex of VTA, situated close to VTA, occasionally subdivided apically (Gertsch, 1934, fig. 21).

DEVIATE: Male (Bridgeport, Mono County): Embolus very stout, RTA with a small tooth developed just dorsal to distal tooth, distal tooth slightly and evenly curved along its entire length.

TYPES: Holotype, male*, allotype, female*, Montpelier, Idaho, July 1930, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Probably widely distributed in Rocky Mountain states and west-

ward. The distribution in California is shown in map 7.

SEASONAL DATA: Adults have been collected in June and July, and one male was taken as early as late May. Penultimate females taken with the May male molted to maturity in the laboratory shortly afterward in that month. Immatures collected in June usually underwent diapause which extended from July or August through October to March.

Rodecki GROUP

Abdomen evenly rounded caudolaterally. Male palpus: Embolus stouter than that in *spectabilis* group. Receptaculum: Torus anterior and spermathecal organ mesial on spermatheca.

***Philodromus (Tibellomimus) quercicola*,
new species**

Philodromus moestus BANKS (female only, not lectotype male), 1904a, p. 353 (lectotype male = *P. rufus* Walckenaer).

FEMALE: Average length 4.0-4.5 mm.

Allatal stripe usually pale brown owing to sparse pigmentation, in some cases moderately dark brown. Legs whitish, often densely and darkly punctate, bands lacking; femur II length index 1.3. Dorsum of abdomen typically entirely white but in some with a reddish tint; cardiac mark and paramedial stripes often developed as indistinct punctate areas; lateral stripe present in some specimens caudally.

Epigynum (fig. 57): Atria shallow and indistinct; median septum indistinct; epigynal sutures parallel.

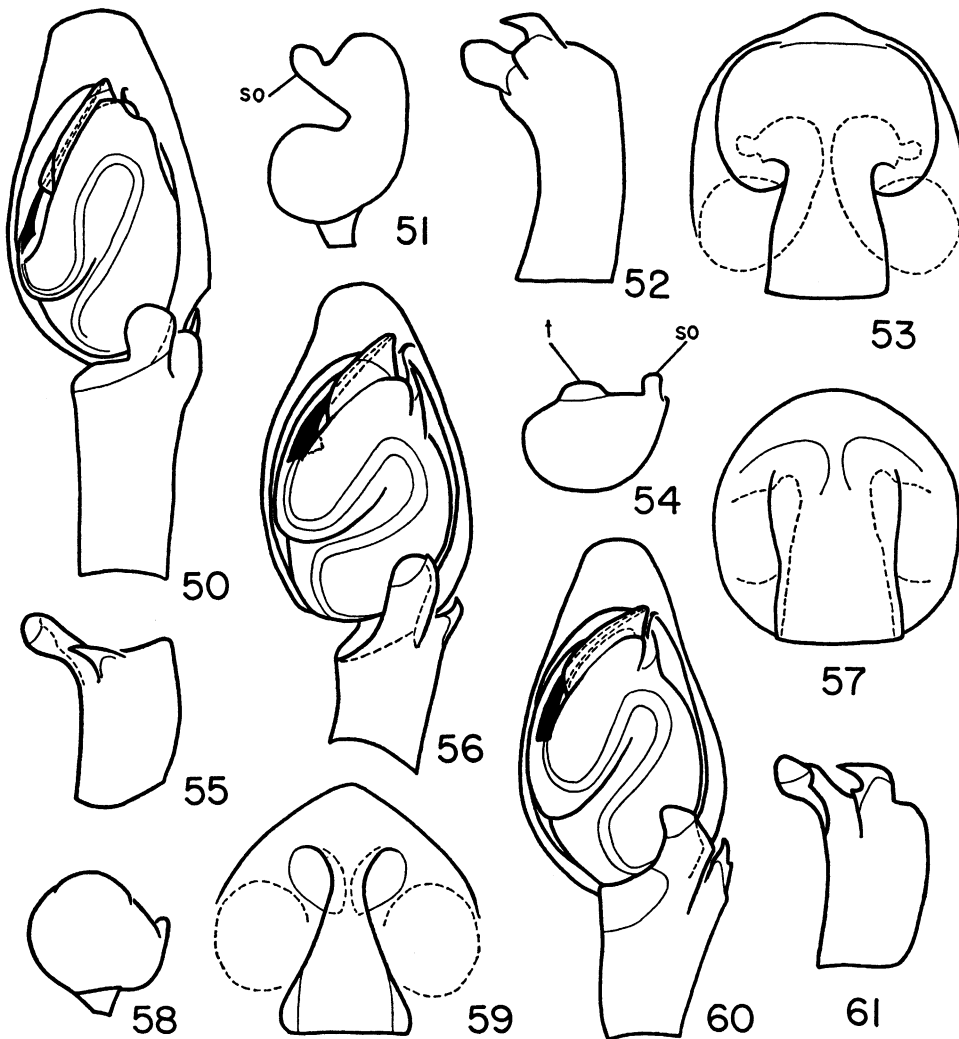
Receptaculum (fig. 54): Spermatheca lenticular.

MALE: Average length about 3.5 mm.

Legs pale brown, lacking distinct markings.

Palpus (figs. 55, 56): Length of bulb 0.42-0.50 mm. Paraembolar apophysis length about three-fourths of that of embolus. Length of tibia 0.24-0.28 mm.; tibial length index 4.3-5.0; distal tooth of RTA simple, terminating far proximal to apex of VTA.

TYPE: Holotype, male, Dardanelle, Tuolumne County, California, June 30, 1946, W. M. Pearce, in the American Museum of Natural History.



FIGS. 50-53. *Philodromus speciosus* Gertsch. 50. Male palpus, ventral view. 51. Receptaculum, dorsal view. 52. Tibia of male palpus, retrolateral view. 53. Epigynum.

FIGS. 54-57. *Philodromus quercicola*, new species. 54. Receptaculum, dorsal view. 55. Tibia of male palpus, retrolateral view. 56. Male palpus, ventral view. 57. Epigynum.

FIGS. 58-61. *Philodromus rodecki* Gertsch and Jellison. 58. Receptaculum, dorsal view. 59. Epigynum. 60. Male palpus, ventral view. 61. Tibia of male palpus, retrolateral view.

Abbreviations: so, spermathecal organ; t, torus.

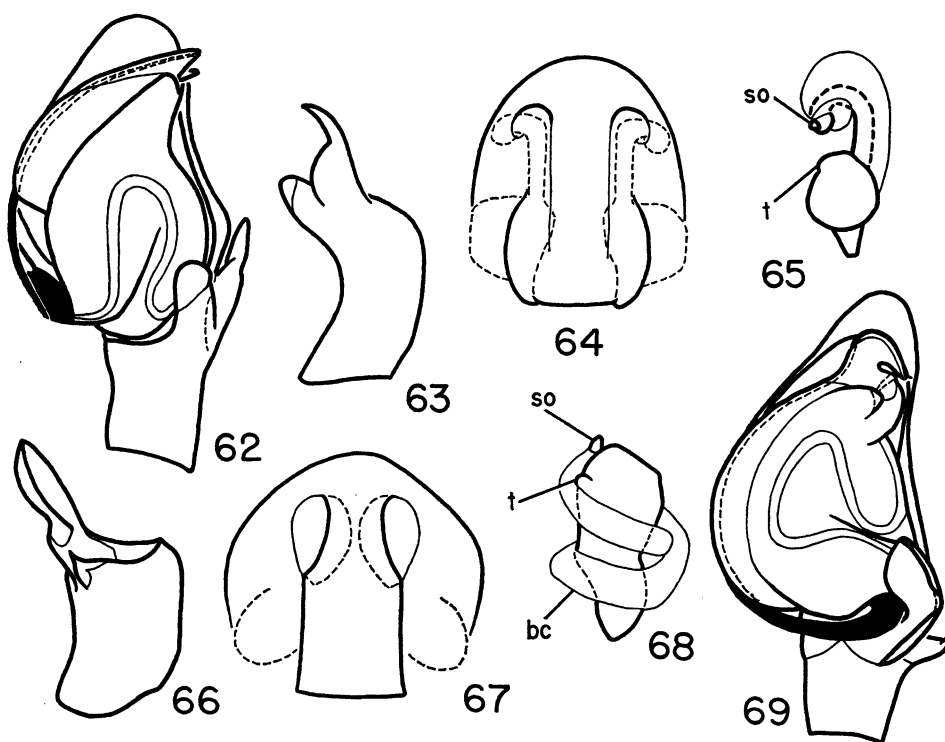
DISTRIBUTION: Known from California only (map 9).

ECOLOGY: Outside the Sierran District *quercicola* shows a marked plant-host preference for oak. *Quercicola* in the Californian Province is most abundant in Coastal Oak Woodland but also occurs in Northern Coastal Scrub.

SEASONAL DATA: Adult males have been collected from March through June; females, from April through July. Penultimate females, collected in March, molted to maturity in that month, and one taken in January became adult in February. An immature female collected in July underwent diapause from October through February and molted



MAP 8. Distributions of *Philodromus rodecki* Gertsch and Jellison and *P. rufus* Walckenaer.



FIGS. 62-65. *Philodromus rufus* Walckenaer. 62. Male palpus, ventral view. 63. Tibia of male palpus, retrolateral view. 64. Epigynum. 65. Receptaculum, dorsal view.

FIGS. 66-69. *Philodromus insperatus*, new species. 66. Tibia of male palpus, retrolateral view. 67. Epigynum. 68. Receptaculum. 69. Male palpus, ventral view.

Abbreviations: bc, bursa copulatrix; so, spermathecal organ; t, torus.

to maturity in May, but an immature male taken in October did not diapause, molting to maturity in April.

Philodromus (Tibellomimus) rodecki
Gertsch and Jellison

Philodromus rodecki GERTSCH AND JELLISON, 1939, p. 7, figs. 4-6.

FEMALE: Average length about 6.0 mm.

Allatal stripe orangish or reddish brown. Legs pale brown or reddish, unmarked; femur II length index 1.4-1.5. Dorsum of abdomen covered with orange or reddish brown scales, with a pale medial stripe giving off lateral branches; cardiac mark and paramedial stripes indistinct, pale purple.

Epigynum (fig. 59): Atria distinctly defined, deep (at least beneath median septum); median septum distinct; epigynal sutures, apparently taken into margins of median septum, converging cephalad.

Receptaculum (fig. 58): Spermatheca globose.

MALE: Average length about 4.5 mm.

Leg markings and coloration like those of female.

Palpus (figs. 60, 61): Length of bulb 0.66-0.69 mm. Paraembolar apophysis length about two-thirds of that of embolus. Length of tibia 0.33-0.39 mm.; tibial length index 4.2-4.6; distal tooth of RTA with a small ventrobasal tooth, distal tooth terminating slightly basal to apex of VTA.

TYPE: Holotype, male*, Boulder, Colorado, 1933, H. G. Rodeck, in the American Museum of Natural History.

DISTRIBUTION: "Southern British Columbia to California and Arizona" (Dondale, MS). The distribution in California is indicated in map 8.

SEASONAL DATA: A mature male has been taken in June, and several females have been

collected in July. A penultimate female collected in June molted to maturity in that month. Two immature males taken in June molted to maturity in the laboratory in February after a diapause that extended from August through February.

Rufus SERIES

Male palpus: Embolus originating near 225 degrees or farther basally (Californian forms), base, as seen ventrally, protruding beyond margin of cymbium; paraembolar apophysis length one-half of that of embolus (Californian forms). Termination point of distal tooth of RTA variable. Receptaculum: Bursa copulatrix an elongate membranous canal wound about spermatheca.

At least two quite distinct groups in the *rufus* series are represented in Nearctica. One group is monotypic, represented by *P. rufus*, and the other consists of *P. imbecillus* Keyserling, *P. insperatus* (described below), and related species.

Philodromus (*Tibellomimus*) *rufus* Walckenaer

Philodromus rufus WALCKENAER, 1824, p. 91.

Philodromus moestus BANKS, 1904a (male lectotype only, not female syntype), p. 353, pl. 39, fig. 29. Synonymy with *rufus* by Dondale (MS).

FEMALE: Average length about 4.0 mm., slightly less in southern San Diegan District.

Allatal stripe brown. Legs pale brown; femur II length index 1.2–1.4. Abdomen rounded caudolaterally; dorsum pale orange to pale brown, in more northern forms often with dark round punctations and middorsal markings indistinct, in San Diegan District forms punctations not developed and middorsal markings (cardiac mark and contiguous paramedial stripes forming a continuous stripe) often dark and distinct.

Epigynum (fig. 64): Atria small, not distinctly delimited from remainder of epigynum caudally; lateral margins of median septum indistinct, parallel; sides of central division convex.

Receptaculum (fig. 65): Spermatheca with distinct proximal and distal subdivisions, the proximal subdivision (around which bursa copulatrix is wound) tubular, bearing spermathecal organ at arched proximal apex, distal subdivision globose; torus broad, situated anteriorly on distal subdivision.

MALE: Average length about 3.0 mm.

Body without an investment of iridescent scales, as contrasted to that of *insperatus*.

Palpus (figs. 62, 63): Length of bulb 0.45–0.48 mm. Embolus originating near 225 degrees, arclike in its curvature; PCA truncate. Length of tibia 0.29–0.32 mm.; tibial length index 5.6–5.9; size of VTA typical of subgenus; distal tooth of RTA larger and terminating farther apical to VTA than in other species of *Tibellomimus*.

TYPES: Male holotype of *rufus* from France. Male lectotype of *moestus** from Santa Clara County, California (new lectotype designation; syntype female* = *P. quercicola*, new species); in the Museum of Comparative Zoölogy.

DISTRIBUTION: Holarctic. "Alaska to Newfoundland, south in the Rocky Mountains to Mexico and, in the east, to Georgia" (Dondale, MS). The distribution in California is shown in map 8.

ECOLOGY: *Rufus* has been collected only in Coastal Oak Woodland or Foothill Woodland outside boreal areas and may be abundant on the oaks or in the grass. Even in the Humboldtian District *rufus* seems to show a preference for oak.

SEASONAL DATA: Mature forms have been collected from February through July, but three penultimate males taken in January molted to maturity in the laboratory in that month.

Philodromus (*Tibellomimus*) *insperatus*, new species

Philodromus pacificus: GERTSCH, 1933b, p. 15.
Nec Philodromus pacificus Banks, 1898.

FEMALE: Average length about 4.0 mm.

Allatal stripe grayish brown. Legs pale yellowish; femur II length index 1.2. Abdomen angulate caudolaterally; dorsum white, in some cases with dark punctations; middorsal markings indistinct; lateral stripe with a dorsal extension near angulation of abdomen forming the most prominent markings visible dorsally.

Epigynum (fig. 67): Atria larger than those in *rufus*, distinctly delimited from remainder of epigynum about entire periphery; lateral margins of median septum distinct, concave; sides of central division nearly parallel.

Receptaculum (fig. 68): Spermatheca rather



MAP 9. Distributions of *Philodromus insperatus*, new species, and *P. quercicola*, new species.

elongate, without proximal and distal subdivisions; spermathecal organ papilliform.

MALE: Average length about 3.0 mm.

Carapace and dorsum of abdomen with an investment of iridescent scales, in life purplish, those of the abdomen a deeper hue; in alcohol setae of carapace brownish and those of abdomen less deeply purple.

Palpus (figs. 66, 69): Length of bulb 0.57–0.63 mm. Embolus originating closer to 180 than to 135 degrees, sinuous; PCA acuate. Length of tibia 0.24 mm.; tibial length index 3.5–3.9; VTA very elongate, apical half projecting at right angle to basal half; distal tooth of RTA small, terminating far basal to apex of VTA.

TYPE: Holotype, male, Weed, Siskiyou County, California, July 4, 1952, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Pacific coast states eastward into Utah. The distribution in California is shown in map 9.

SEASONAL DATA: Mature forms have been collected from May through July.

REMARKS: The specific name *insperatus*, derived from the Latin meaning "unexpected" (Brown, 1956), refers to the striking metamorphosis from the dull gray penultimate male to the beautiful iridescent purple adult stage. This species can be separated from *P. mineri* Gertsch and *P. imbecillus* Keyserling by the narrower distal end of the bulb, the more distal origination of the embolus, and (in Californian forms at least) the pronounced sinuosity of the apical portion of the embolus.

SUBGENUS *PHILODROMOIDES* SCHEFFER

TYPE: *Philodromoides pratariae* Scheffer, 1904.

Venter of femora III and IV in most species with a vestiture of long, pale, filiform hairs. Male palpus: Embolus without prominences and emarginations, not flattened; paraembolar apophysis absent; conductor (homology to *Philodromus* and *Tibellomimus* conductor uncertain) a stout apophysis, apex usually protecting apical portion of embolus; PCA and VBA not apparent; distal margin of tegulum with a characteristic, thin, slightly concave, platelike apophysis developed between PCA and dorsal margin of tegulum

(fig. 70, A); subtegulum prominent in unexpanded bulb. Tibia about as broad as long; VTA sclerotized; RTA with a prolateral division conjoined with VTA (fig. 70, pd) and, in most species, a strongly developed, scooplike, retrolateral division bearing a ventral tooth (vt) and often a dorsal tooth (dt). Receptaculum: Bursa copulatrix not apparent; spermatheca bearing both spermathecal organ and torus; elongate duct of spermathecal organ present.

Philodromus (Philodromoides) infuscatus Keyserling

Philodromus infuscatus KEYSERLING, 1880, pp. 222–223, pl. 5, fig. 122.

FEMALE: Average length 4.0–5.0 mm., slightly less in specimens from Inyo Montane District.

Markings and coloration very variable. Carapace orange to dark gray, with maculae or speckled markings; allatal stripe often present, lateral or mesial in position on allatum; pars cephalica width index 3.9–4.4, usually 4.0–4.2 (San Diegan District), 4.0–4.8, usually 4.4–4.5 (Mojavian District), 4.0–4.5 in others; carapace spiniforms setaceous. Legs with stripes, bands, maculae, or punctations; femur I with dorsal and prodorsal spiniforms; tibia I, usually 3–3.0 or 2(1)3–0; basitarsus I, 2–2–2; femur II length index 1.3–1.5. Abdomen angulate caudo-laterally, white, orange, reddish gray to dark gray, with distinct markings; dorsum lacking strong spiniforms.

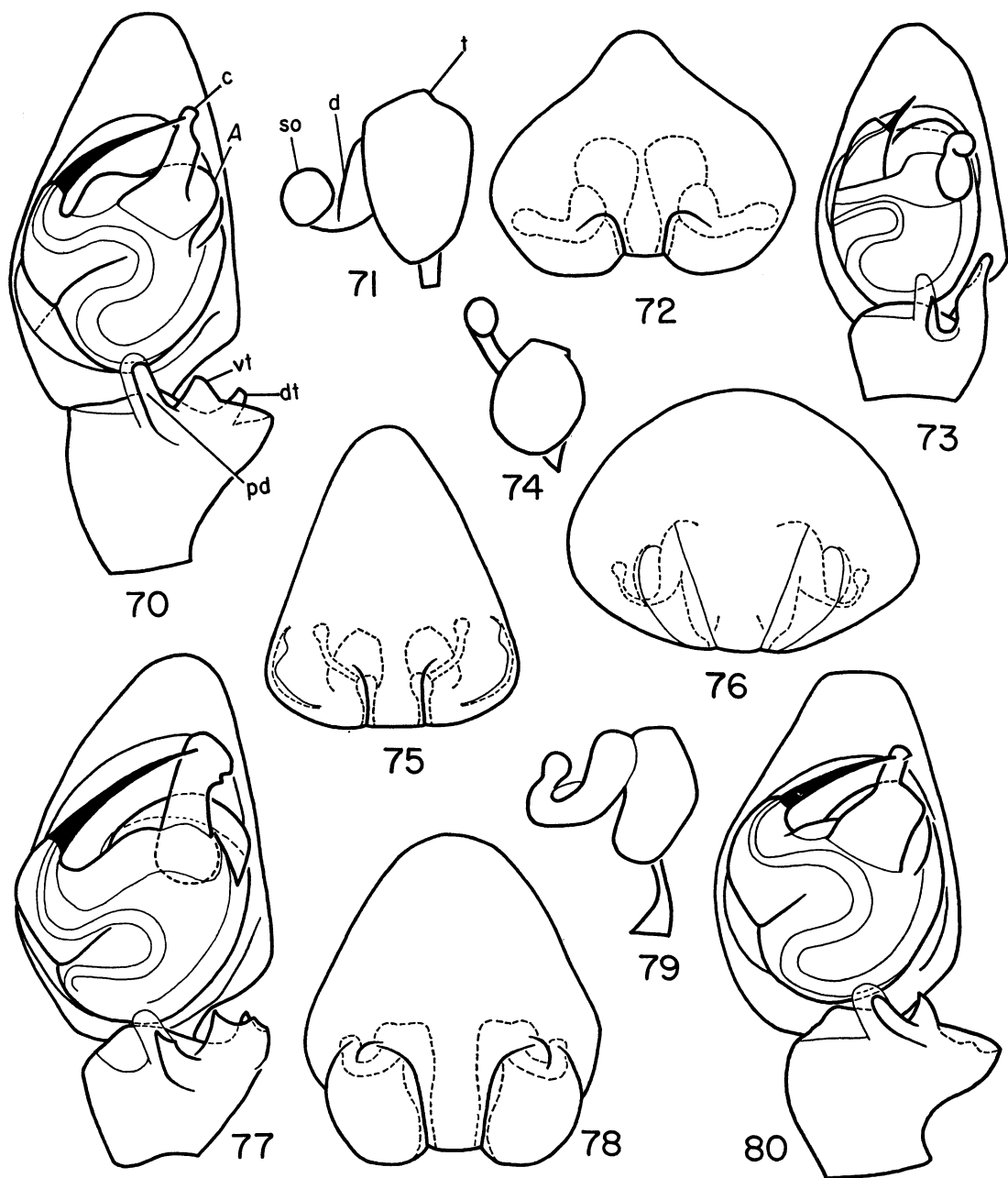
Epigynum (fig. 72): Posterior margin distinctly emarginate in region of central division; central division shorter than that of *droseroides*; anterior part of epigynal suture curving laterocaudad and connecting with slitlike intromittent orifice.

Receptaculum (fig. 71): Spermatheca elongate; spermathecal organ duct originating on ventral surface of spermatheca, portion of duct visible through epigynal integument transversely oriented; anterior margin of torus sloping laterad.

MALE: Average length about 3.5 mm.

Markings and coloration like those of female.

Palpus (fig. 70): Length of bulb 0.33–0.38 mm.; embolus originating at tapered apex of tegulum and extending to conductor; conduc-



FIGS. 70-72. *Philodromus infuscatus* Keyserling. 70. Male palpus, ventral view. 71. Receptaculum, dorsal view. 72. Epigynum.

FIGS. 73-75. *Philodromus anomalus* Gertsch. 73. Male palpus, ventral view. 74. Receptaculum, dorsal view. 75. Epigynum.

FIG. 76. *Philodromus coachellae*, new species, epigynum.

FIGS. 77-79. *Philodromus droseroides*, new species. 77. Male palpus, ventral view. 78. Epigynum. 79. Receptaculum, dorsal view.

FIG. 80. *Philodromus verityi*, new species, male palpus, ventral view.

Abbreviations: A, an apophysis of the tegulum; c, conductor; d, duct of spermathecal organ; dt, dorsal tooth; pd, prolateral division; vt, ventral tooth (the last three of RTA); so, spermathecal organ; t, torus.



MAP 10. Distributions of *Philodromus infuscatus* Keyserling, *P. verityi*, new species, *P. droseroides*, new species, *P. coachellae*, new species, and *P. anomalus* Gertsch.

tor with an apicoretrolateral fold, thus appearing tapered. Length of cymbium 0.50–0.66 mm.; tibia 0.22–0.28 mm., tibial length index 4.2–5.3. RTA typical of genus; prolateral division rounded apically, terminating closer to tip of VTA than in *droseroides*; ventral tooth rather blunt, situated about midway between VTA and retrolateral apex of RTA; dorsal tooth well developed, more recumbent than in *droseroides*, inclined at a sharp angle to dorsal margin of RTA (as seen from a distal view).

DEVIATE: Male, reared (Beverly Glen Canyon, Los Angeles County): Palpus larger than that of other specimens, length of bulb 0.42 mm., cymbium 0.69 mm., tibia 0.33 mm. RTA identical to that of *verityi* (i.e., ventral tooth pointed, situated closer to VTA than to retrolateral apex of RTA, dorsal tooth rudimentary).

TYPE: Holotype, female, Baltimore [Koch collection, British Museum (Natural History)].

DISTRIBUTION: United States and Canada. The distribution in California is shown in map 10.

SEASONAL DATA: Mature forms have been taken from September through November. Immature males and females collected in June matured in August and September in the laboratory.

REMARKS: This species in the southwestern United States appears to comprise several geographical races which differ from one another rather strikingly in markings and coloration but not in genitalia. In general, western specimens of *infuscatus* differ from the eastern forms in the slightly longer embolus, the presence of a strong dorsal tooth on the RTA, and other minor characters of the RTA.

***Philodromus (Philodromoides) verityi*,
new species**

FEMALE: Average length 4.0–4.5 mm.

Body mahogany red in life (fading to dull red in alcohol), lacking contrasting markings. Pars cephalica width index 3.8–4.4; carapace spiniforms setaceous. Legs less robust than those of *infuscatus*; femur I in some cases lacking dorsal and prodorsal spiniforms; tibia I, 2(1)2-0; basitarsus I, 2-2-2; femur II length

index 1.2–1.3. Abdomen angulate caudolaterally, lacking distinct spiniforms.

Epigynum, receptaculum: Similar to those of *infuscatus*.

MALE: Average length about 3.0 mm.

Facies like that of female.

Palpus (fig. 80): Length of bulb 0.38–0.39 mm.; embolus originating at tapered apex of tegulum and extending to conductor; sides of conductor nearly parallel, apicoretrolateral side not so strongly folded as in *infuscatus*. Length of cymbium 0.54–0.60 mm., tibia 0.24–0.27 mm., tibial length index 4.0–4.8. RTA typical of genus, prolateral division apically rounded, terminating closer to tip of VTA than in *droseroides*, ventral tooth pointed, situated closer to VTA than to retrolateral apex of RTA, dorsal tooth rudimentary.

TYPE: Holotype, female, $\frac{1}{2}$ mile south of Coldbrook Camp, San Gabriel Mountains, Los Angeles County, California, October 23, 1958 (maturation date in laboratory, March 21, 1959), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 10).

ECOLOGY: All specimens of *verityi* have been collected on manzanita, *Arctostaphylos* spp. The mahogany red coloration of *verityi* is similar to that of the bark of the manzanita. Some species of *Misumenops*, one of *Theridion*, and some insects, all found mainly on manzanita, are similarly colored.

SEASONAL DATA: Only two adults have been taken in nature, both females in June, but reared males mature as early as February and females as early as March.

REMARKS: Reproductive isolation of *verityi* from sympatric *infuscatus* may be maintained by a difference in the temporal distribution of the adults of both species and host-plant specificity of *verityi*.

This species is named for David Verity.

***Philodromus (Philodromoides) droseroides*,
new species**

FEMALE: Average length about 4.0 mm.

Carapace partly white and partly palely infuscate; allatum entirely white laterally; pars cephalica width index 4.5–4.8; carapace spiniforms blunt to clavate. Legs with a

characteristic narrow middorsal and midventral stripe; bands, maculae, and punctations not developed; femur I devoid of spiniforms; tibia I, 0(1)3-0 to 0(3)4-0; basitarsus I, 1-2-1 to 2-2-1; femur II length index 1.2. Abdomen rounded caudolaterally, entirely white, typically unmarked, dorsally with characteristic, conspicuous, dark, capitate spiniforms.

Epigynum (fig. 78): Posterior margin distinctly emarginate in region of central division; central division longer than that of *infuscatus*, *verityi*, or *anomalus*; anterior end of epigynal suture curving cephalolaterad to connect with slitlike intromittent orifice.

Receptaculum (fig. 79): Spermatheca more slender than that of *infuscatus* or *verityi*; spermathecal organ duct originating on lateral or dorsal surface of spermatheca; portion of duct visible through epigynal integument curving cephalad in distal portion; anterior edge of torus nearly parallel to transverse plane.

MALE: Average length 3.0–3.5 mm.

Markings, coloration, and chaetotaxy similar to those of female, but infuscations of carapace and stripes of legs tending to be darker, and dorsal abdominal setae less strongly clavate.

Palpus (fig. 77): Length of bulb 0.40–0.48 mm.; embolus, longer than in other Californian species of *Philodromoides*, originating at tapered apex of tegulum and extending to conductor; conductor broadening apicad, lacking apicoretrolateral fold. Length of cymbium 0.62–0.66 mm., tibia 0.21–0.22 mm., tibial length index 3.2–3.5. RTA typical of genus; prolateral division apically acuate, terminating farther from tip of VTA than in *infuscatus* or *verityi*; ventral tooth acuate, situated closer to retrolateral apex of RTA than to VTA; dorsal tooth well developed, more erect than that of *infuscatus*, nearly parallel to dorsal margin of RTA (as seen from distal view).

TYPE: Holotype, male, Little Rock, Los Angeles County, California, May 26, 1957 (maturation date in laboratory, August 20, 1957), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 10).

SEASONAL DATA: Reared juveniles have matured from July through September.

REMARKS: The abdomen, with its sparse

vestiture of conspicuous, dark, capitate spiniforms, is suggestive of the appearance of the sun-dew flower, *Drosera*, hence the name *droseroides*.

***Philodromus (Philodromoides) coachellae*,
new species**

FEMALE: (Based on holotype). Length 3.25 mm.

Allatum with medial stripe; pars cephalica width index 4.4; carapace spiniforms setaceous. Legs with numerous small punctations and small maculae; femur I with dorsal and prodorsal spiniforms; tibia I, 2(1)2-0; basitarsus I, 2-2-2; femur II length index 1.5. Abdomen angulate caudolaterally, dorsum dark, with a darker caudal band and weakly developed setaceous spiniforms.

Epigynum (fig. 76): Posterior margin not distinctly emarginate; epigynal suture not curved or reaching intromittent orifice; a low ridge present, extending obliquely from caudal margin of epigynum cephalad to orifice.

Receptaculum: Not examined internally. Spermathecal organ duct, visible through epigynal integument, curved cephalad, distally quite slender, the spermathecal organ at least twice its diameter.

MALE: Unknown.

TYPE: Holotype, female, Snow Creek Canyon (near settlement), Riverside County, California, April 13, 1955, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California from the holotype (map 10).

***Philodromus (Philodromoides) anomalus*
Gertsch**

Philodromus anomalus GERTSCH, 1934, pp. 16–17, figs. 20, 26.

FEMALE: Average length about 4.0 mm.

Carapace yellowish, allatal stripe present; pars cephalica width index 4.8–5.0; carapace spiniforms setaceous. Legs usually with numerous small punctations especially dense on ventral and prolateral surfaces, maculae developed in some cases; femur I with dorsal and prodorsal spiniforms; tibia I, 1-2-0; basitarsus I, 2-2-2 or 2-2-1; femur II length index 1.2–1.3. Abdomen angulate caudolaterally, dorsum largely white, with a typically red caudal band, distinct spiniforms lacking.

Epigynum (fig. 75): Smaller than that of

other species of the genus, with a relatively larger sclerotized area cephalad of intromittent orifices than that of other species of *Philodromoides*; posterior margin not distinctly emarginate; central division shorter than that of *infuscatus*, *verityi*, and *droseroides*, epigynal suture curving laterad to connect with slitlike intromittent orifice.

Receptaculum (fig. 74): Smaller than that of other species of the genus; spermatheca rather rotund; spermathecal organ duct a slender tube throughout its length, portion of duct visible through integument of epigynum obliquely to longitudinally oriented; anterior edge of torus sloping mesiad.

MALE: (Based on one Californian specimen). Length, 2.75 mm.

Markings and coloration similar to those of female but legs darker and with distinct bands.

Palpus (fig. 73): Length of bulb 0.24 mm.; embolus shorter than that of other species of *Philodromoides*, not reaching conductor, originating mesially on truncate apex of tegulum; conductor with a distal fold. Length of cymbium 0.34 mm., tibia 0.14 mm., tibial length index 4.0. Main body of RTA produced as an elongate narrow apophysis (not scooplike), its axis paralleling that of the tibia; intermediate and dorsal teeth lacking.

TYPES: Holotype, male, allotype, female, Scottsdale, Arizona, January 29, 1903, in the American Museum of Natural History.

DISTRIBUTION: California (map 10); Arizona.

SEASONAL DATA: Females have been taken in April and September, and a male was collected in September.

GENUS RHYSODROMUS, NEW GENUS

Philodromus of authors, in part.

TYPE: *Thomisus histrio* Latreille, 1819.

AME usually subequal in size to ALE, in some cases larger; PME closer to PLE than to ALE or these eyes equidistant. Femur II length index 1.5–1.8 (females); tarsi markedly more strongly scopulate than those of typical *Philodromus*; basitarsus I with proventral spiniform 2 situated typically in basal half of segment, one proapical spiniform present. Abdomen not angulate caudolaterally. Male palpus: Embolus compressed along entire length; middle loop of reservoir with apical

arm markedly shorter than basal arm; PCA present. VTA variable when present. Epigynum: Epigynal suture developed along ventral face of epigynum as well as in epigastri-furrow.

The reasons for separating *Rhysodromus* from *Philodromus* are discussed in the introduction to the latter genus, and the data are tabulated in table 4. The group represented by *Philodromus virescens* Thorell is treated as the subgenus *Rhysodromus*, and the group represented by *Philodromus alascensis* Keyserling as the subgenus *Locupletus*. These subgenera are quite distinct in their genitalia but appear to comprise a common phyletic group distinct from *Philodromus* and *Ebo*.

The name *Rhysodromus* is derived from the Greek *rhysis* which means "deliverance" (Brown, 1956) and connotes the long-deserved emancipation of this group from *Philodromus*.

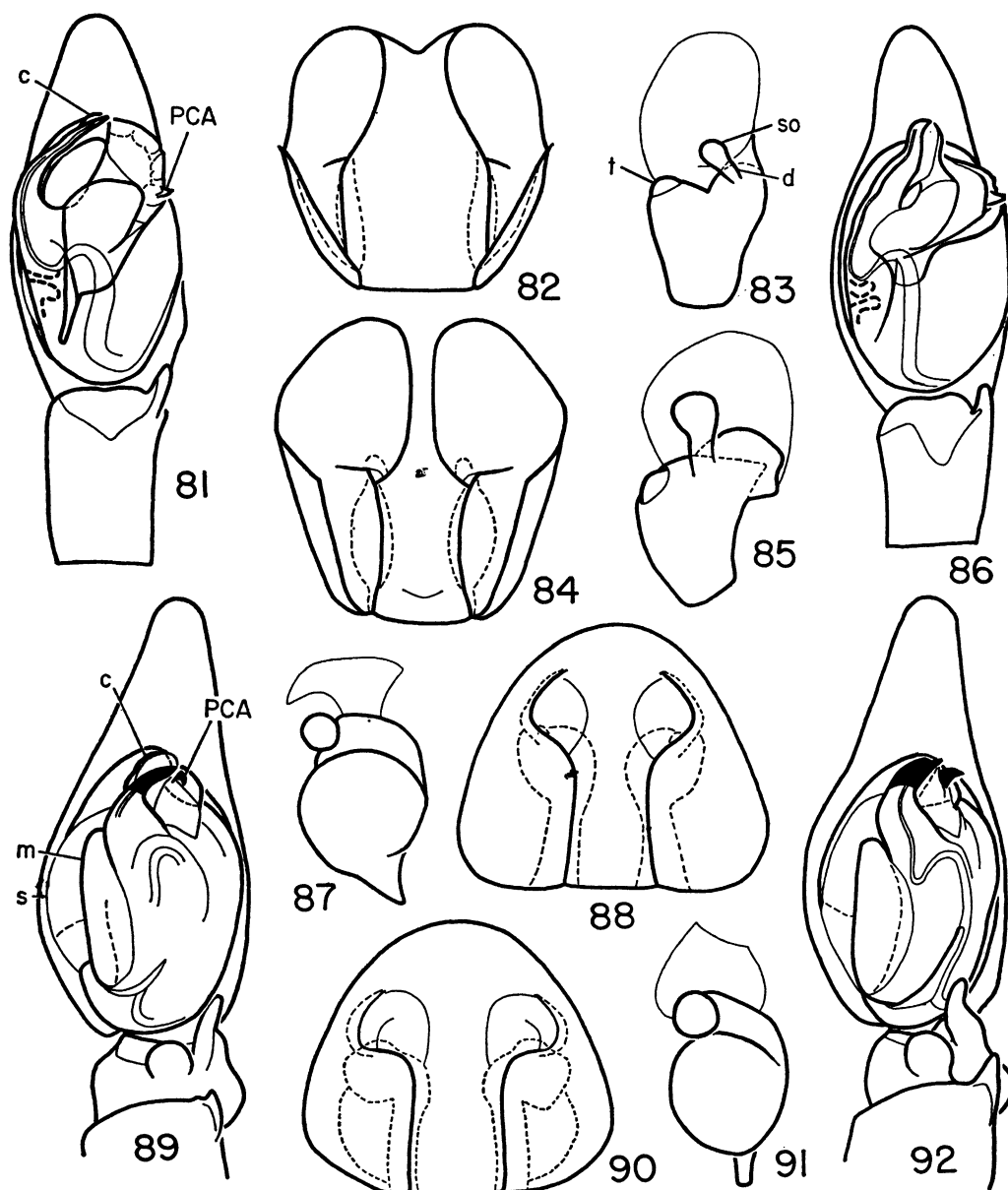
KEYS TO THE SPECIES OF *Rhysodromus* IN CALIFORNIA

Males

1. Patella of palpus without a retrolateral apical apophysis; VTA not present (subgenus *Rhysodromus*) 2
- Patella of palpus with a retrolateral apical apophysis; tibia with a ventral, hairy, rounded lobe (subgenus *Locupletus*) . . . 3
- 2(1). Embolus markedly sinuous, axis at angle to transverse plane which is greater than 45 degrees (fig. 86) . . . *histrio californicus*
- Embolus with axis not markedly sinuous, axis at angle to transverse plane which is close to 45 degrees (fig. 81) . . . *histrio clarus*
- 3(1). Proventral spiniform 2 of basitarsus I situated in basal half of segment. Embolus narrow, evenly tapered at tip (fig. 89) *alascensis alascensis*
- Proventral spiniform 2 of basitarsus I situated in distal half of segment or near midline. Embolus broader, with a distoapical notch (fig. 92) *alascensis dondalei*

Females

1. Epigynum with a distinct median septum and lateral atria (subgenus *Rhysodromus*) 2
- Epigynum lacking a median septum and lateral atria (subgenus *Locupletus*) . . . 3
- 2(1). Median septum narrow (fig. 84); spermathecal organ duct originating near midsagittal plane of spermatheca or farther



FIGS. 81-83. *Rhysodromus histrio clarus* (Keyserling). 81. Male palpus, ventral view. 82. Epigynum. 83. Receptaculum, dorsal view.

FIGS. 84-86. *Rhysodromus histrio californicus*, new subspecies. 84. Epigynum. 85. Receptaculum, dorsal view. 86. Male palpus, ventral view.

FIGS. 87-89. *Rhysodromus alascensis alascensis* (Keyserling). 87. Receptaculum, dorsal view. 88. Epigynum. 89. Male palpus, ventral view.

FIGS. 90-92. *Rhysodromus alascensis dondalei*, new subspecies. 90. Epigynum. 91. Receptaculum, dorsal view. 92. Male palpus, ventral view.

Abbreviations: c, conductor; d, duct of spermathecal organ; m, membranous area; s, subtegulum; so, spermathecal organ; t, torus.

- laterally (requires dissection; fig. 85). *histrion californicus*
 Median septum broader (fig. 82); spermathecal organ duct originating near mesial margin of spermatheca (requires dissection; fig. 83) *histrion clarus*
 3(1). Proventral spiniform 2 of basitarsus I situated in basal half of segment. Lateral guide pockets of epigynum rather closely approximated (fig. 88) *alascensis alascensis*
 Proventral spiniform 2 of basitarsus I situated in distal half of segment. Lateral guide pockets more widely spaced (fig. 90) *alascensis dondalei*

SUBGENUS RHYSODROMUS, NEW SUBGENUS

TYPE: *Thomisus histrion* Latreille, 1819.

Male palpus: Sclerite supporting conductor movable, articulating at retrolateral base of embolus; PCA developed as a low, arcuate, irregularly toothed, distiretrolateral structure, with one or two teeth more strongly produced; VTA rudimentary; tegulum not extensively membranous prolaterally; dorsal surface of tegulum lacking large condyle; subtegulum not prominent in unexpanded bulb. Tibia longer than broad; RTA small, rodlike; VTA not developed. Patella without a distal apophysis. Epigynum: Median septum and lateral atria present. Receptaculum: Elongate spermathecal organ duct present.

The first-named New World form in *Rhysodromus* was *Philodromus virescens* Thorell, 1877, described from Colorado. *Virescens* is morphologically very similar to the Palearctic *Philodromus* (now *Rhysodromus*) *histrion* Latreille, 1819, and on this basis may be considered subspecifically related. This treatment is favored by Gertsch and Ivie (*in litt.*).

Three Nearctic forms appear to comprise *Rhysodromus histrion* in North America: *h. virescens* Thorell (Utah, Colorado), *h. clarus* Keyserling (California, Nevada), and *h. californicus*, new subspecies (California). These forms may grade into one another.

Rhysodromus (Rhysodromus) histrion clarus (Keyserling), new combination

Philodromus clarus KEYSERLING, 1880, pp. 214-215, pl. 5, fig. 117. Synonymy with *virescens* by Banks (1895) disclaimed.

FEMALE: Average length 6.0-6.5 mm.

Whitish to grayish white in life, white to

brownish in alcohol. Pars cephalica strongly produced; allatal stripe mesial. Legs with discontinuous dorsal stripes; tibia I typically 2-2-0; basitarsus I, 2-2-1. Cardiac mark of abdomen dark gray, in some cases outlined by a line of iridescent green scales (not apparent in alcohol); dorsum of abdomen typically with several oblique gray and white stripes radiating from cardiac mark and often with a narrow dorsomedial stripe extending caudad from posterior tip of cardiac mark.

Epigynum (fig. 82): Median septum variable in width but typically broader than that of *h. californicus*.

Receptaculum (fig. 83): Spermathecal organ duct typically originating near mesial margin of spermatheca; torus often situated on a domelike anteriolateral prominence of the spermatheca.

MALE: Average length about 5.0 mm.

Palpus (fig. 81): Palpus smaller than that of *h. californicus*, length of cymbium 0.84-0.96 mm. Conductor shorter and embolus narrower than those of *h. californicus*. Embolus not markedly sinuous, axis at about a 45-degree angle to the transverse plane of the bulb.

DEVIATE: Female (Benton, Mono County): Epigynum typical of *clarus* but receptaculum similar to that of *h. californicus*.

TYPES: Syntypes, male, female, Nevada (Simon collection, Museum National d'Histoire Naturelle, Paris).

DISTRIBUTION: California (map 11); Nevada.

ECOLOGY: This species shows a marked preference for sagebrush, *Artemisia tridentata* Nuttall, even in the Sierran District, but in the Great Valley probably occurs in grass.

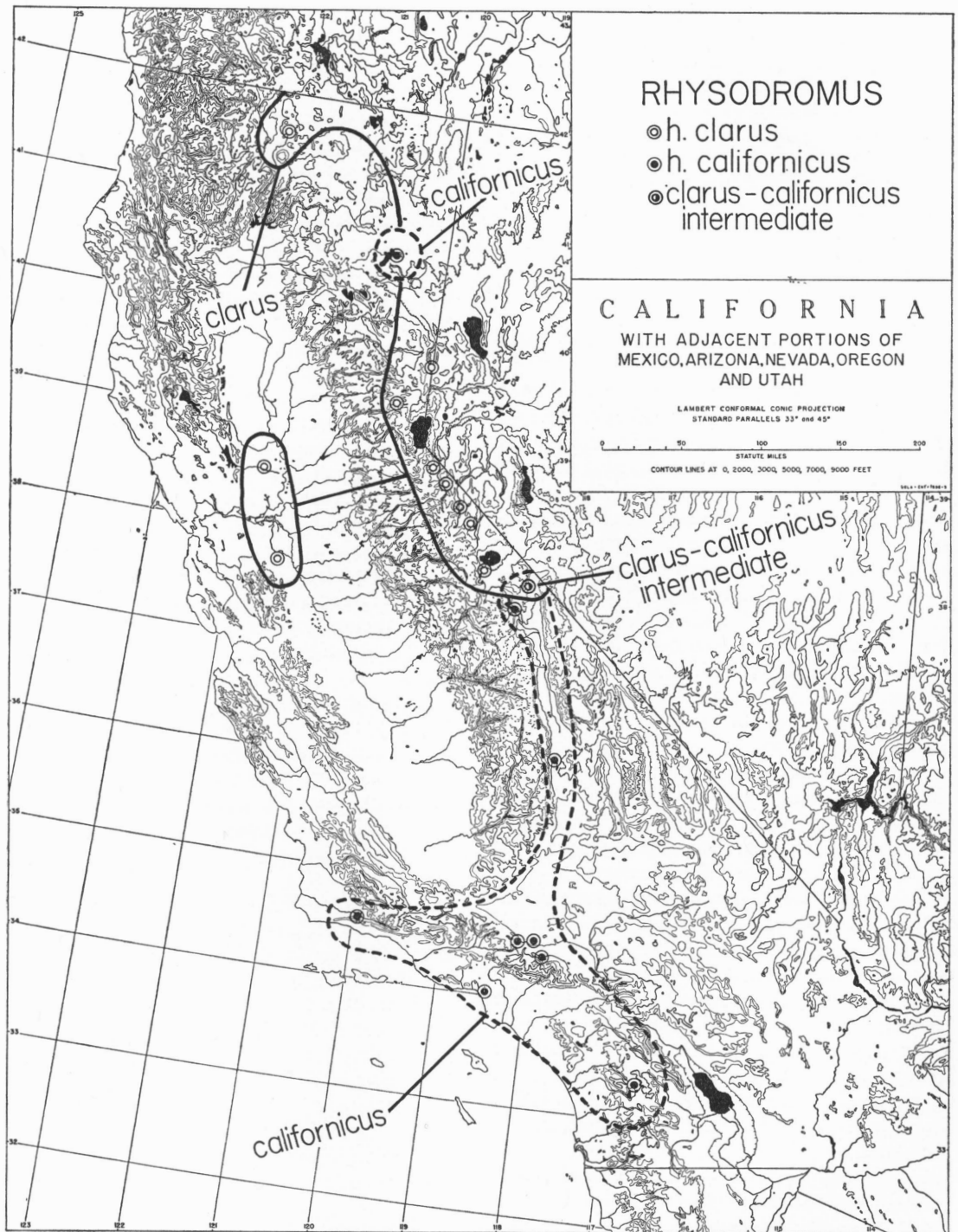
SEASONAL DATA: Mature forms have been taken from March through July. Three immature males taken in September molted to maturity in February, March, and April.

REMARKS: This form is called *clarus* here mainly on the basis of comparison with a collection from Nevada which is the type locality. Also Keyserling's figure of the male palpus is suggestive of this form.

Rhysodromus (Rhysodromus) histrion californicus, new subspecies

FEMALE: Average length 6.0-6.5 mm.

Markings and coloration similar to those of



MAP 11. Distributions of *Rhysodromus histrio clarus* (Keyserling) and *R. h. californicus*, new subspecies.

h. clarus, but lacking iridescent scales about cardiac mark.

Epigynum (fig. 84): Median septum variable in width, but narrower than that of typical *h. clarus*.

Receptaculum (fig. 85): Spermathecal organ duct originating from near midsagittal plane of spermatheca to near lateral margin; anteriolateral margin of spermatheca evenly rounded and bearing torus.

MALE: Average length about 5.75 mm.

Markings and coloration similar to those of female.

Palpus (fig. 86): Palpus larger than that of *h. clarus*, length of cymbium 1.02–1.08 mm. Conductor more elongate and embolus broader than those of *h. clarus*. Embolus distinctly sinuous, axis at an angle greater than 45 degrees to transverse plane of bulb.

DEVIATE: Male, reared (Sherwin Summit, Mono County): Bulb small, similar in size to that of *clarus*, embolus intermediate in structure between *clarus* and typical *californicus*.

TYPE: Holotype, male, Little Rock, Los Angeles County, California, November 1, 1957 (maturation date in laboratory, December 3, 1957), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 11).

ECOLOGY: *Californicus*, like *clarus*, shows a great preference for sagebrush, *Artemisia tridentata* Nuttall, but has been found also on *Atriplex* spp. in the Mojavian District and in grass in Coastal Oak Woodland.

SEASONAL DATA: Mature forms have been taken from March through July. Immature males collected from late summer to late fall matured from December through February; two immature females collected in the same period, in February and March.

REMARKS: An apparent north-south cline in the width of the median septum of the epigynum, taking both forms as a whole, is suggestive of subspecific relationship between *clarus* and *californicus*. In addition, the palpus of a male, collected midway between the main desert ranges of the two forms (map 11), appears to be intermediate in structure. On the other hand, a *californicus* male showing no obvious *clarus* tendencies has been taken deep in the desert range of *clarus*, which suggests a specific relationship.

SUBGENUS LOCUPLETUS, NEW SUBGENUS

Philodromus of authors, in part.

TYPE: *Philodromus alascensis* Keyserling, 1884.

Male palpus: Sclerite supporting conductor a fixed apophysis; PCA stout and acuate, basally expanded to form a rounded sclerite usually situated in a membranous area; tegulum prolaterally membranous (fig. 89, m), dorsally with a robust condyle (not apparent in the unexpanded bulb) which articulates with the subtegulum; subtegulum prominent prolaterally in unexpanded bulb (s). Tibia about as broad as long, RTA curved ventrad; VTA typically present, developed as a mid-ventral, subapical, hairy lobe or as an elongate apophysis contiguous with RTA, similar to that of the subgenus *Horodromus* of *Apolophanes*. Patella typically elongate and with a retrolateral apical apophysis. Epigynum: Median septum and lateral atria not developed. Receptaculum: Elongate spermathecal organ duct not present.

Locupletus is Holarctic in distribution and comprises at least two typical forms and one undescribed atypical species in North America. The name *Locupletus* is derived from *locuples*, meaning "rich" or "opulent" (Brown, 1956) and refers to the numerous structural elaborations of the male palpus.

Rhysodromus (Locupletus) alascensis alascensis (Keyserling), new combination

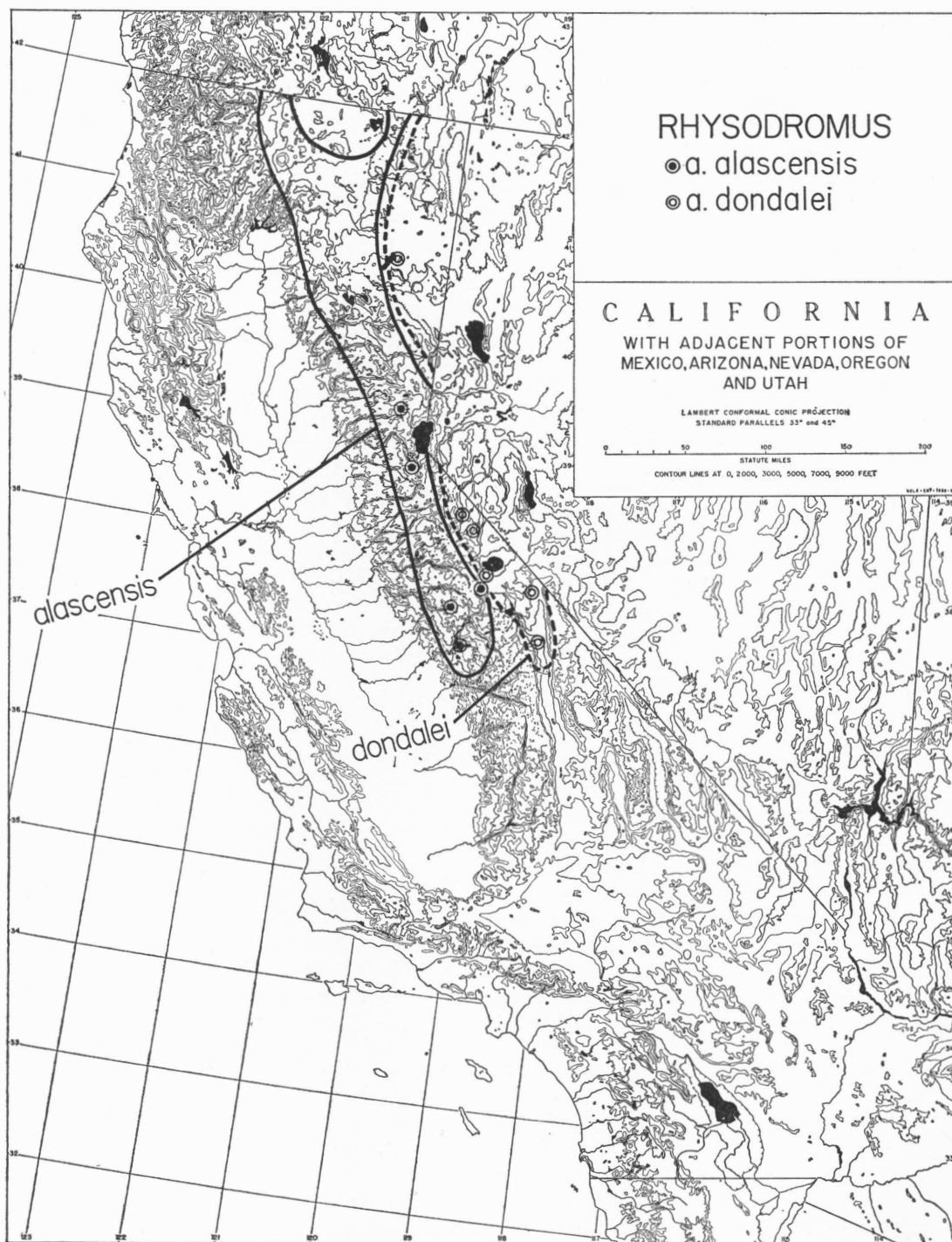
Philodromus alascensis KEYSERLING, 1884, pp. 28–29, fig. 22. GERTSCH, 1934, p. 19.

FEMALE: Average length 5.5 mm.

General coloration brownish red in life, red tint fading in alcohol. Legs more slender than those of *a. dondalei*, bands broad, in some cases indistinct, pigmentation homogeneous; proventral spiniform 2 of basitarsus I situated in basal half of segment. Dorsum of abdomen with a pale, indistinctly marked area immediately caudal to cardiac mark; cardiac mark typically with a short, narrow, lateral extension in posterior half.

Epigynum (fig. 88): Guide pockets more closely approximated and epigynal orifice situated farther cephalically than in *a. dondalei*.

Receptaculum (fig. 87): Spermathecal organ variable in size, from the size shown in



MAP 12. Distributions of *Rhysodromus alascensis alascensis* (Keyserling) and *R. a. dondalei*, new subspecies.

figure 88 to as large as that illustrated for *a. dondalei* (fig. 91).

MALE: Length 4.5–5.0 mm.

Legs and abdomen darker than those of female. Dorsum of abdomen lacking pale area caudal to cardiac mark.

Palpus (fig. 89): Embolus evenly tapered at tip; PCA more slender than that of *a. dondalei*, more strongly curved; distal portion of apophysis, bearing the conductor, conspicuous ventrally. Tibia-patella length ratio 1/1.8–1.9. Retrolateral patellar apophysis shorter than that of *a. dondalei*.

TYPE: Holotype, female, Alaska, Marx, in the United States National Museum.

DISTRIBUTION: "Throughout most of Canada, the northern part of the Mississippi basin, all the region west of the Rocky Mountains, Alaska, and Siberia. It apparently has never been taken on the eastern seaboard and there is only one record from the southern states" (Gertsch, 1934). The distribution in California is shown on map 12.

SEASONAL DATA: Males and females have been taken in July. Immature females collected in June and September molted to maturity in November and December, showing no sign of diapause.

***Rhysodromus (Locupletus) alascensis dondalei*,
new subspecies**

FEMALE: Average length 5.0–5.5 mm.

General coloration brown. Legs stouter than those of *a. alascensis*, with broad, in some cases indistinct, bands comprising densely spaced punctations; proventral spiniform 2 of basitarsus I situated near middle of segment or farther distally. Dorsum of abdomen entirely pigmented and marked; cardiac mark typically without a narrow lateral extension.

Epigynum (fig. 90): Guide pockets more widely spaced and intermittent orifices situated farther caudally than in Californian *a. alascensis*.

Receptaculum as shown in figure 91.

MALE: Average length 5.0 mm.

Markings and coloration similar to those of female, but dorsum of abdomen paler and markings less distinct.

Palpus (fig. 92): Embolus stouter in distal portion than that of *a. alascensis*, with a distiapiical emargination; PCA stouter and

axis less strongly curved than those of *a. alascensis*; distal portion of apophysis bearing conductor not conspicuous ventrally. Tibia-patella length ratio 1/2.2–2.4. Retrolateral patellar apophysis longer than that of *a. alascensis*.

TYPE: Holotype, male, 7 miles south of Lee Vining, on state highway 120, Mono County, California, September 7, 1957 (maturation date in laboratory, November 4, 1957), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 12); Nevada; Utah.

SEASONAL DATA: Two mature females have been taken in April and May. Immature males and females collected in June and September molted to maturity in the laboratory in October and September without diapause.

GENUS EBO KEYSERLING

Ebo KEYSERLING, 1884, p. 678. SIMON, 1895, p. 1063.

Titanebo GERTSCH, 1933b, pp. 10–11. New synonymy (also by Gertsch, *in litt.*).

TYPES: Of *Ebo*, *Ebo latithorax* Keyserling, 1884. Of *Titanebo*, *Titanebo macyi* Gertsch, 1933.

AME in every case distinctly larger than ALE; PME closer to PLE than to ALE or these eyes equidistant. Femur II length index 1.6–2.1 (females); tarsi of most species (i.e., subgenus *Titanebo*) more densely scopulate than those of most species of *Philodromus*; proventral spiniform 2 of basitarsus I situated in distal half of segment, one spiniform or none present. Abdomen rounded caudolaterally. Male palpus: Embolus typically flattened and arched in basal portion (fig. 93, ae); conductor a narrow, shallow, membranous, retrolateral groove; middle loop of reservoir with basal and apical arms not markedly dissimilar in length; PCA absent. VTA broad, situated close to or contiguous with RTA. Epigynum: With a pair of rounded bilateral posterior plates; epigynal suture situated entirely in epigastric furrow. Receptaculum: Spermatheca divided into two distinct parts, a proximal intermittent division, bearing the spermathecal organ, and a more heavily sclerotized distal division, bearing the torus.

The characters that distinguish *Rhyso-*

dromus from *Philodromus* also distinguish *Ebo* from *Philodromus* (table 4), a fact that suggests a closer relationship of *Ebo* to *Rhyso-*
dromus than to *Philodromus* (the thinly scop-
ulate tarsi of the subgenus *Ebo* is undoubt-
edly a secondary reduction).

Two Nearctic subgenera can be distin-
guished, *Titanebo* and *Ebo*. The species of
Titanebo are larger and can be further distin-
guished by the higher clypeus, denser leg
scopulation, non-reduced leg spiniformation,
and non-reduced VTA of the male palpus.
Unlike that of other species of the Thomisi-
dae, the epigynum of most of the species of
Ebo is quite similar and does not appear to be
of value as a specific diagnostic tool.

In the following descriptions comparison of
the width or of the length of the arch of the
embolus between the different species is based
on these dimensions relative to the length of
the tegulum. The width of the arch refers to
the distance from the base of the embolus to
the more apical part transversely opposite the
point; the length of the arch refers to the
longitudinal distance from the level of the
base of the embolus to the apex of the arch.

KEY TO THE SPECIES OF *Ebo* IN CALIFORNIA

1. Tibiae I and II and basitarsi I and II
lacking prolateral spiniforms (subgenus
Ebo) 2
- Tibiae I and II and basitarsi I and II with
two or three prolateral spiniforms (sub-
genus *Titanebo*) 3
- 2(1). Patellae, tibiae, and basitarsi with a dark
middorsal stripe; tibia I and basitarsus I
lacking distinct spiniforms (female un-
known) *merkei*
- Legs lacking a middorsal stripe; tibia I
and basitarsus I, 0-2-0 . . . *pepinensis*
- 3(1). Allatal stripe not developed; eyes light
gray to bluish; body often completely
covered by gold-colored scales but in
some cases scales dark brown
. *creosotis*
- Allatal stripe distinct; eyes black . . . 4
- 4(3). Males 5
- Females (all subsequent couplets require
dissection of the female genitalia) . . 11
- 5(4). Bulb relatively broad, only 1.3-1.4 times
as long as broad; embolus curving pro-
laterad in apical portion (fig. 104) . . .
. *dispar*
- Bulb relatively narrower, at least 1.7
times as long as broad; embolus curving
slightly retrolaterad in apical portion
. 6
- (6)5. Tibial length index 20; conductor length
index 4.2 (fig. 93) *macyi*
- Tibial length index 12 at most; conductor
length index usually greater than 4.2,
rarely less 7
- 7(6). Tibial length index 11-12; conductor
length index 8.1-8.3 (fig. 111)
. *andreaannae*
- Tibial length index usually at most 10, in
only one of numerous examples seen,
11; conductor length index at most 7.1
. 8
- 8(7). Embolus abruptly tapering relatively far
apicad (fig. 103). Dorsum of abdomen
dark gray cephalad and with a sharply
demarcated, caudal, white area devoid
of spiniforms *albocaudatus*
- Embolus (as in fig. 106) and abdomen not
as above 9
- 9(8). Embolus relatively short (fig. 106), con-
ductor length index 3.8-5.3, usually less
than 5.0; RTA tridentate or bidentate
. *mexicanus*
- Embolus longer (figs. 101, 110), conductor
length index as little as 4.8 but usually
greater than 5.0; RTA unidentate,
bidentate, or 5-dentate, rarely tri-
dentate 10
- 10(7). Embolus longer and width of arch greater
(fig. 101); conductor length index 6.7-
7.1; RTA typically bidentate. Abdomen
without a caudolateral, bronze-colored
area *californicus*
- Embolus shorter in typical forms and
width of arch less (fig. 110); conductor
length index 4.8-5.8; RTA typically uni-
dentate, apicodorsal margin rounded.
Abdomen often with a caudolateral,
bronze-colored area *parabolis*
- 11(4). Intromittent division expanded beneath
venter of entire spermatheca (as well as
laterad and cephalad of spermatheca);
spermathecal organ situated on mesial
margin (fig. 105) *dispar*
- Intromittent division produced mainly
laterad of spermatheca, spermathecal
organ situated at or near lateral margin
. 12
- 12(11). Intromittent division extending broadly
cephalad of spermatheca (figs. 98, 109)
. 13
- Intromittent division extending only
slightly beyond anterior tip of sper-
matheca (figs. 100, 102, 107) 15
- 13(12). Anterior portion of intromittent division

not expanded, anterior margin usually sloping caudolaterad (fig. 109), not extending so far cephalad of the spermatheca as usual in *californicus*

. *parabolis*
Anterior portion of intromittent division expanded, anterior margin horizontal or sloping caudomesiad, usually extending even farther cephalad of spermatheca than is shown in figure 98 14

14(13). Dorsum of abdomen with gold-colored scales *andreaannae*

Dorsum of abdomen without gold-colored scales *californicus*

15(12). Intromittent division produced beyond spermatheca much more strongly anteriolaterad than posteriolaterad, spermathecal organ not marginal (fig. 107) *mexicanus*

Intromittent division not as above, spermathecal organ marginal 16

16(15). Dorsum of abdomen dark gray in anterior half, with a sharply defined white area devoid of spiniforms in posterior half. Intromittent division as shown in figure 102 *albocaudatus*

Dorsum of abdomen without a sharply defined caudal white area. Intromittent division as shown in figure 100 *macyi*

SUBGENUS TITANEBO GERTSCH

TYPE: *Titanebo macyi* Gertsch, 1933.

Clypeus relatively high, at least 1.5 times the AME interdistance. Tibiae and basitarsi each with at least two prolateral spiniforms; telotarsal scopulation dense. Male palpus: Embolus more elongate than that of the subgenus *Ebo*, with an abruptly narrowed apical portion; conductor in form of elongate retro-lateral groove. VTA well developed.

Two groups can be recognized in California, the *macyi* group, consisting of the majority of our species of *Titanebo*, and the *dispar* group, which is monotypic.

Macyi GROUP

Male Palpus: Bulb relatively narrower than that of *dispar* group, from 1.7–2.0 times as long as broad. Embolar arch relatively shorter and narrower than that of *dispar* group, width equal at most to two and one-third times length of tegulum. Receptaculum: Intromittent division extending beneath only a portion of spermatheca; spermathecal organ

originating at or near lateral margin of intromittent division.

Ebo (*Titanebo*) *macyi* (Gertsch), new combination

Titanebo macyi GERTSCH, 1933b, pp. 11, 13, fig. 11.

FEMALE: (Based on one specimen). Length 5.25 mm.

Allatal stripe present. Femur II length index 2.1. Abdomen more elongate than that of most other species of *Ebo*, white, with dark gray dorsal markings; cardiac mark elongate, without prominent lateral extensions; lateral stripe dorsomarginal; paramedial stripes distinct, separated anteriorly by a distance about equal to their width, convergent caudad.

Receptaculum (fig. 100): Intromittent division produced laterally beyond only anteriolateral margin of spermatheca, more narrowly than in *parabolis*, and beyond level of anterior margin only slightly; anterior margin of intromittent division of greater convexity than that of *mexicanus*; spermathecal organ originating at lateral margin of intromittent division and caudal to anterior margin.

MALE: (Based on one specimen). Length 4.75 mm.

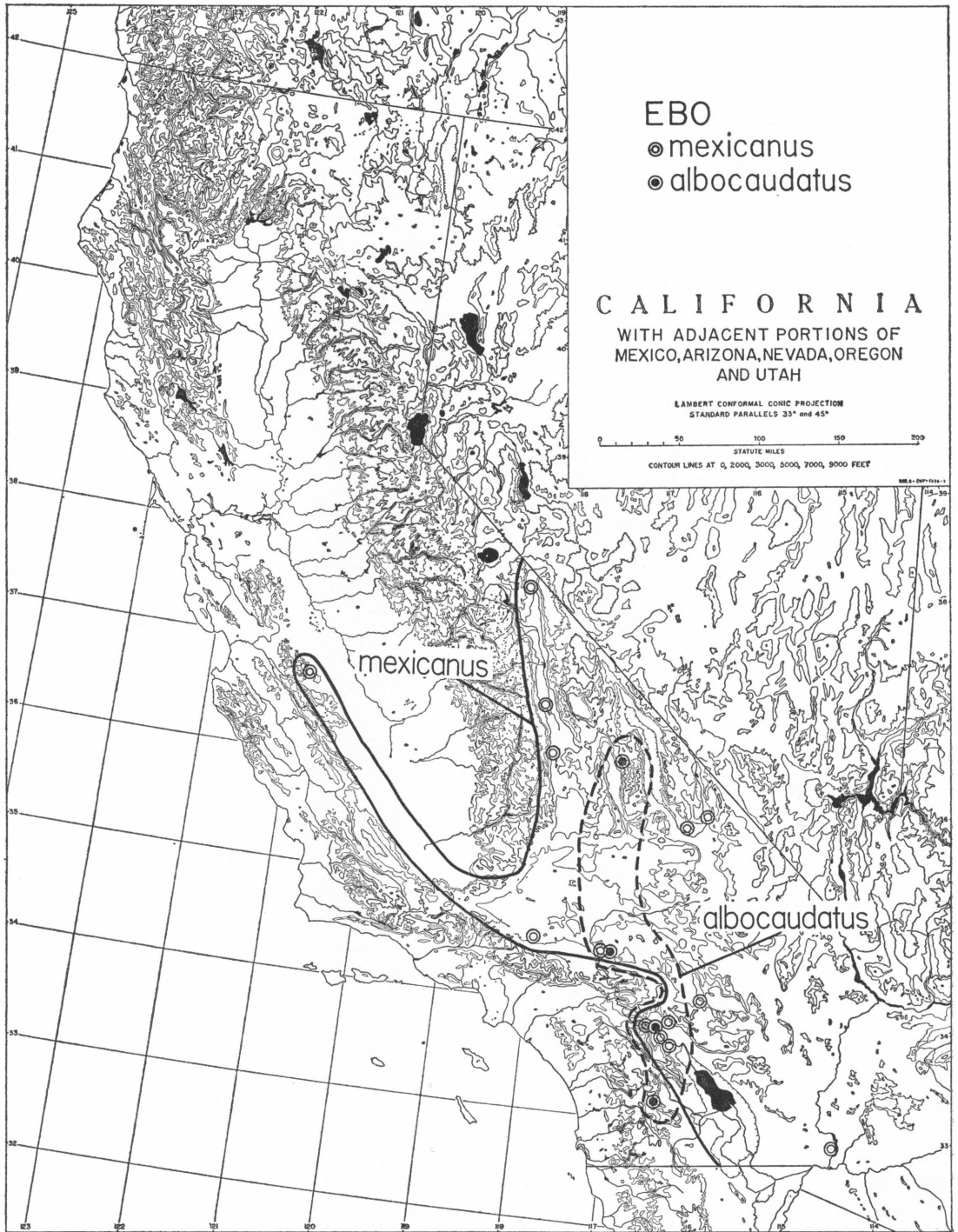
Markings and coloration similar to those of female. Femur II length index 3.0.

Palpus (fig. 93): Length of bulb 0.57 mm., 1.7 times as long as broad. Embolus abruptly tapered farther basad than that of *albocaudatus*, length and width of arch less than in *californicus*; conductor length index 4.2; tegular suture at a distance from proximal margin of tegulum of just less than one-half of length of tegulum. Tibia much longer than cymbium, tibial length index 20; RTA unidentate.

TYPES: Holotype, male*, allotype, female*, Cape Mearns, Tillamook County, Oregon, August 20, 1931, R. W. Macy, in the American Museum of Natural History.

DISTRIBUTION: California (map 15); Oregon.

SEASONAL DATA: A penultimate male and female collected in September matured shortly afterward in the same month.



MAP 13. Distributions of *Ebo mexicanus* Banks and *E. albicaudatus*, new species.

Ebo (Titanebo) mexicanus Banks

Ebo mexicanus BANKS, 1898, pp. 265–266, pl. 16, fig. 9.

Ebo cockerelli BRYANT, 1933, pp. 187–188, pl. 2, figs. 15, 18, pl. 3, figs. 27, 36. New synonymy.

Titanebo cockerelli: GERTSCH, 1933b, p. 8.

Titanebo mexicanus: GERTSCH, 1933b, p. 11.

Titanebo tridentatus CHAMBERLIN AND IVIE, 1942, p. 80, figs. 226, 227. New synonymy.

FEMALE: Average length about 4.0 mm.

Allatal stripe distinct. Femur II length index 1.9–2.0. Cardiac mark distinct, typically with lateral extensions better developed than in *californicus*; other abdominal markings (usually not so distinct as those of *californicus*) as follows: lateral stripes curving caudomesiad onto dorsum near middle of abdomen where they become contiguous with paramedial stripes; paramedial stripes separated from cardiac mark by narrow white line, converging caudad of cardiac mark, and caudad of cardiac mark usually separated from each other by a white line.

Receptaculum (fig. 107): Intromittent division produced laterad beyond entire length of spermatheca, to a much greater extent beyond cephalolateral margin, and beyond level of anterior margin of spermatheca only narrowly; anterior margin of intromittent division evenly convex; spermathecal organ originating centrally on projecting portion of intromittent division.

MALE: Average length 3.0–3.5 mm.

Markings and coloration similar to those of female. Femur II length index 2.4–2.6.

Palpus (fig. 106): Length of bulb 0.57 mm., about 1.7 times as long as broad. Embolus abruptly tapered farther basad than that of *albocaudatus*, length and width of arch less than those of *californicus*; conductor length index 3.8–5.3, averaging about 4.7; tegular suture separated from proximal margin of tegulum by a distance of about three-eighths of length of tegulum. Tibial length index 10 or less; RTA typically tridentate in southern Saltonian District, but usually bidentate in other parts of California.

TYPES: Two female syntypes of *mexicanus* (only one female in vial*), Hermosillo, Mexico, in the Museum of Comparative Zoölogy. Holotype, male*, and allotype, female*, of *cockerelli*, Mesilla Park, New Mexico, in the Museum of Comparative Zoölogy. Holotype,

male*, of *tridentatus*, longitude 103° W., latitude 48° N., Divide County, North Dakota (cited as "probable locality"), in University of Utah collection.

DISTRIBUTION: Mexico proper and Baja California into Kansas and the southwestern United States. The distribution in California is shown in map 13.

SEASONAL DATA: Mature forms have been taken throughout the year.

REMARKS: *Mexicanus* shows two types of RTA. In one the apophysis is more parallel to the axis of the tibia and has three apical teeth; in the other the apophysis projects from the tibia at a greater angle and has two apical teeth. (The former type is developed in the holotypes of *cockerelli* and *tridentatus*.) Both types of RTA appear to be characteristic of various geographic populations, but, with only scanty collections, I have not been able to detect any distributional patterns that would indicate that two taxa are involved. The RTA of one Mexican specimen appears to be intermediate, and in one Californian collection (1000 Palms Canyon, Riverside County) both types were found. Females show no apparent corresponding genitalic differences.

Ebo (Titanebo) albocaudatus, new species

FEMALE: Average length about 4.0 mm.

Leg proportions similar to those of *mexicanus*. Allatal stripe distinct. Anterior half of dorsum of abdomen with dark gray markings and erect spiniforms, but posterior half a sharply delimited white area lacking spiniforms.

Receptaculum (fig. 102): Intromittent division produced beyond entire lateral margin of spermatheca, to a greater extent beyond caudolateral margin, and beyond level of anterior margin of spermatheca only narrowly, if at all; anterior margin of intromittent division evenly convex; spermathecal organ originating at anteriolateral apex of intromittent division.

MALE: Average length 3.5–4.0 mm.

Markings and coloration similar to those of female. Leg proportions similar to those of *mexicanus*.

Palpus (fig. 103): Length of bulb 0.54–0.56 mm., about 1.6–1.7 times as long as broad. Embolus abruptly tapered relatively farther

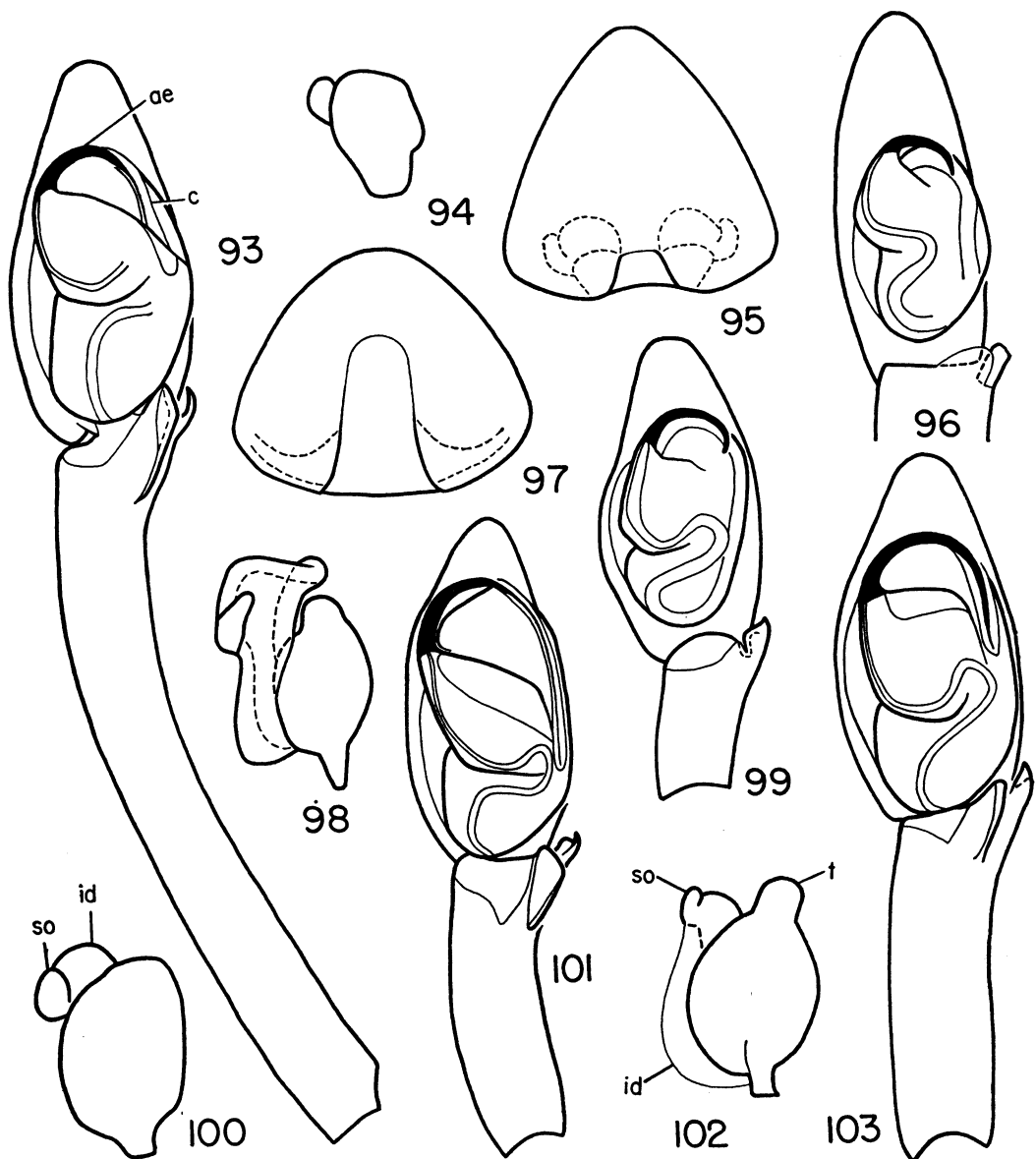


FIG. 93. *Ebo macyi* (Gertsch), male palpus, ventral view.

FIGS. 94-96. *Ebo pepinensis* Gertsch. 94. Receptaculum, dorsal view. 95. Epigynum. 96. Male palpus, ventral view.

FIG. 97. *Ebo*, subgenus *Titanebo*, epigynum.

FIG. 98. *Ebo californicus* (Gertsch), receptaculum, dorsal view.

FIG. 99. *Ebo merkei*, new species, male palpus, ventral view.

FIG. 100. *Ebo macyi* (Gertsch), receptaculum, dorsal view.

FIG. 101. *Ebo californicus* (Gertsch), male palpus, ventral view.

FIGS. 102, 103. *Ebo albocaudatus*, new species. 102. Receptaculum, dorsal view. 103. Male palpus, ventral view.

Abbreviations: ae, arch of embolus; c, conductor; id, intromittent division; so, spermathecal organ; t, torus.

distad than that of other species of *macyi* group, length of arch less and width greater than in *californicus*; conductor length index 4.3–5.6, averaging about 4.9; tegular suture at a distance of slightly less than three-eighths of length of tegulum from proximal margin of tegulum. Tibial length index 10 or less; RTA bidentate or unidentate.

TYPE: Holotype, male, Victorville, San Bernardino County, California, February, 1953, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 13); Arizona.

SEASONAL DATA: Mature forms have been taken from February through March; one female was taken as late as June.

REMARKS: *Albocaudatus* can usually be distinguished from other Californian species of *Ebo* by the sharply defined white area on the dorsum of the abdomen. Some specimens of *mexicanus*, *parabolis*, and *andreaannae*, however, show a similarly defined pale caudal area on the abdomen, but it usually is invested with yellow scales.

***Ebo* (*Titanebo*) *parabolis*, new species**

FEMALE: Average length about 4.0 mm.

Leg proportions similar to those of *mexicanus*. Markings and coloration similar to those of *californicus*, but abdomen characteristically with a caudolateral, bronze-colored area interrupting the mesially converging segment of the lateral stripe, this coloration in some cases invading entire dorsocaudal portion of the abdomen and obliterating the paramedial stripes to varying degrees. (In the latter case, this dorsocaudal area is often white and the facies of the spider is similar to that of *E. albocaudatus*.)

Receptaculum (fig. 109): Intromittent division laterally produced beyond only anteriolateral margin of spermatheca, more broadly so than that in *macyi*, and beyond level of anterior margin more broadly than that in *macyi*, *mexicanus*, or *albocaudatus*, but more narrowly than usual in that of *californicus*; anterior margin of intromittent division straight, inclined laterocaudad; spermathecal organ originating centrad of margins of intromittent division but closer to lateral than to anterior margin.

MALE: Average length about 4.0 mm.

Leg proportions similar to those of *mexicanus*. Markings and coloration similar to those of female, but bronze-colored area restricted to lateral parts of abdomen.

Palpus (fig. 110): Length of bulb 0.57–0.75 mm., 1.7–2.0 times as long as broad. Embolus abruptly tapered relatively farther basad than that of *albocaudatus*, length of arch similar to that of *californicus* but width less; conductor length index 4.8–5.9 in typical specimens (see below); tegular suture at a distance from proximal margin of tegulum of slightly less than three-eighths of length of tegulum. Tibial length index 10 or less; RTA typically unidentate, distidorsal margin smoothly rounded.

DEVIATES: Male (Coldbrook Camp, Los Angeles County): Conductor length index 5.6 (typical of *parabolis*), but embolar arch more similar to that of *mexicanus* and RTA quinquedentate.

The following four specimens (discussed below) cannot be determined with certainty as *parabolis* or *californicus*: Two males (Fresno, June 26–30, 1955; July 1–15, 1955): Conductor length indices 6.7, 7.1 and RTA bidentate (*californicus*-like). Arch of embolus *parabolis*-like. Male (Benton, Mono County, May 10, 1942): Arch of embolus *californicus*-like. Conductor length index 5.9 and RTA unidentate (*parabolis*-like). Male (Benton, Mono County, September 6, 1958; reared to maturity): Conductor length index 6.7 and RTA bidentate (*californicus*-like). Arch of embolus *parabolis*-like.

TYPE: Holotype, male, Eagle Lake, northeast shore on Susanville-Adin road, Lassen County, California, June 20, 1958 (maturation date in laboratory, December 18, 1958), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 14); Oregon; Arizona.

SEASONAL DATA: Mature specimens have been taken from February through July (the earlier forms in the lower deserts). However, laboratory-reared immatures may mature in the fall or early winter.

REMARKS: Two types of interesting situations, possibly involving the hybridization of *parabolis* with other species, are encountered in collections of *Ebo*.

In one situation, in which *parabolis* has

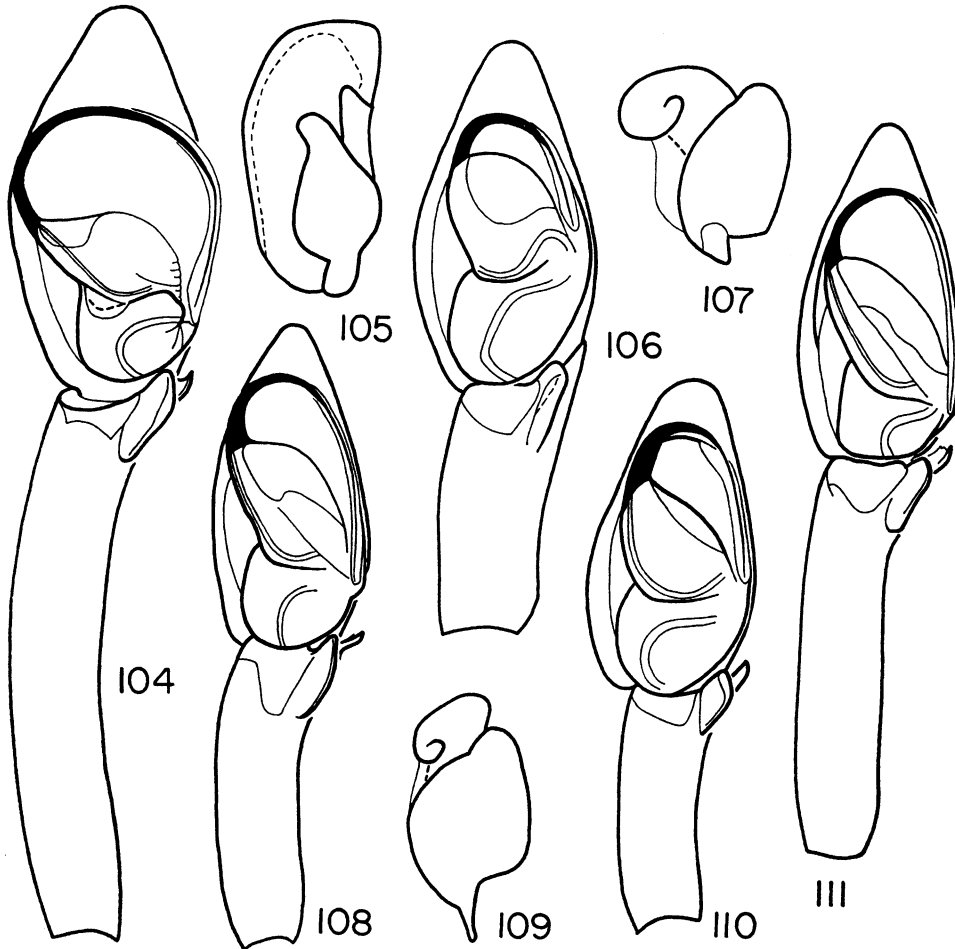


MAP 14. Distributions of *Ebo parabolis*, new species, and *E. californicus* (Gertsch).

been collected with closely related species, some individuals of *parabolis* show the characteristic abdominal markings and coloration of the other species or, conversely, the other species shows the characteristic *parabolis* abdominal markings and coloration. However, the genitalia, on which basis identifications were made, are not intermediate. The following instances are known: a female of *parabolis* with *mexicanus* facies taken with a series of *mexicanus* (Coachella Valley, Riverside County); two females of *parabolis*, one

with *albocaudatus* facies, taken with a series of *albocaudatus* (Cochise County, Arizona); one male of *californicus* with *parabolis* facies taken with two females of *parabolis* (Pinyon Flat, San Jacinto Mountains).

In the other situation, the palpal structure of four male specimens (described above) suggests that hybridization between *parabolis* and *californicus* is occurring. Typical specimens of both species have been collected in the areas from which the intermediate specimens are known (from Benton, as well as



FIGS. 104, 105. *Ebo dispar*, new species. 104. Male palpus, ventral view. 105. Receptaculum, dorsal view.

FIGS. 106, 107. *Ebo mexicanus* Banks. 106. Male palpus, ventral view. 107. Receptaculum dorsal view.

FIG. 108. *Ebo creosotis*, new species, male palpus, ventral view.

FIGS. 109, 110. *Ebo parabolis*, new species. 109. Receptaculum, dorsal view. 110. Male palpus, ventral view.

FIG. 111. *Ebo andreaanae*, new species, male palpus, ventral view.

other parts of the Monoan District, and in the Great Valley District). Of note is the dissimilarity in the combination of characters of the intermediate Benton specimens and the similarity to each other of the two intermediate Fresno specimens.

Further collecting and crossbreedings are necessary to resolve these problems.

Ebo (Titanebo) californicus (Gertsch),
new combination

Titanebo californicus GERTSCH, 1933b, p. 14, fig. 12.

FEMALE: Average length about 4.0 mm.

Leg proportions like those of *mexicanus*. Abdomen typically dark gray, markings similar to those of *mexicanus*, but cardiac mark more slender and without a prominent lateral extension; other markings more distinct than usual in *mexicanus*.

Receptaculum (fig. 98): Intromittent division variable in size and form (fig. 98 showing one of the less expansive examples), produced beyond entire lateral margin of spermatheca and beyond level of anterior margin usually more broadly than that in *parabolis*; anterior margin of intromittent division straight or convex, horizontal or inclined mesocaudad; spermathecal organ originating at lateral margin of intromittent division and caudal to anterior margin.

MALE: Average length about 4.0 mm.

Leg proportions similar to those of *mexicanus*, markings and coloration similar to those of female.

Palpus (fig. 101): Length of bulb 0.63–0.70 mm., 1.8 times as long as broad. Embolus abruptly tapered relatively farther basad than that in *albocaudatus*, length of arch greater than that in *macyi*, *mexicanus*, or *albocaudatus*, width of arch greater than that in *macyi*, *mexicanus*, or typical *parabolis*; conductor length index 6.7–7.2; tegular suture at a distance from proximal margin of tegulum of from one-fourth to three-eighths of length of tegulum. Tibial length index 10 or less; RTA typically bidentate, in one specimen from Inyo Montane District tridentate.

TYPE: Holotype, male*, San Francisco, California, R. F. Sternitzky, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 14).

SEASONAL DATA: Mature forms have been taken throughout the year, the majority in late spring and early summer. However, immatures collected in June molted to maturity in late fall to early winter.

REMARKS: See the paragraphs on *Deviates* and Remarks under *parabolis*.

Ebo (Titanebo) creosotis, new species

FEMALE: Average length 4.0–4.5 mm.

Body and legs usually covered by gold-colored scales, dark brown scales present in some individuals. Allatal stripe lacking. Femur II length index 1.7–1.9, usually 1.8. Cardiac mark not distinct in some, lateral and paramedial stripes not developed.

Receptaculum similar to that of *californicus*.

MALE: (Based on two specimens). Length 4.0 mm.

Markings and coloration similar to those of female. Femur II length index 2.2 and 2.4.

Palpus (fig. 108): Length of bulb 0.70–0.71 mm., 1.9–2.0 times as long as broad. Embolus abruptly tapered relatively farther basad than that of *albocaudatus*, arch proportionately as elongate as that of *californicus*, but width less; conductor length index 7.7; tegular suture at a distance from proximal margin of tegulum of from one-fourth to three-eighths of length of tegulum. Tibial length index 10 or less; RTA bidentate.

TYPE: Holotype, male, Twentynine Palms, San Bernardino County, California, October, 1944, J. H. Branch, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 15).

ECOLOGY: All specimens of this species have been taken on creosote bush, *Larrea divaricata* Cavanilles.

SEASONAL DATA: Mature forms have been taken in just two collections, a male in October and females in February. Immature males and females collected in September matured in October and November.

Ebo (Titanebo) andreaannae, new species

FEMALE: Length about 5.0 mm.

Allatal stripe present. Femur II length index 1.9–2.1, averaging 2.0. Cardiac mark with a prominent lateral extension like that in *mexicanus*; lateral stripe short, developed



MAP 15. Distributions of *Ebo macyi* (Gertsch), *E. creosotis*, new species, *E. andreaannae*, new species, and *E. dispar*, new species.

only in anterior half of abdomen; paramedial stripe represented by an elongate area of gold-colored scales, or caudum of abdomen similar in appearance to *albocaudatus* but gold-colored.

Genitalia similar to those of *californicus*, but receptaculum tending to be larger.

MALE: Average length 4.5–5.0 mm.

Markings and coloration similar to those of female. Femur II length index 2.8–3.0.

Palpus (fig. 111): Length of bulb 0.69–0.76 mm., 1.9–2.0 times as long as broad. Embolus abruptly tapered relatively farther basad than that in *albocaudatus*, arch proportionately more elongate but as broad as that in *californicus*; conductor length index 8.1–8.3; tegular suture at a distance of about one-fourth of length to tegulum from proximal margin of tegulum. Tibia much longer than cymbium, tibial length index 11–12, usually the latter; RTA bidentate.

TYPE: Holotype, male, 3.5 miles south of Palmdale near U. S. Highway 6, Los Angeles County, California, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 15); Arizona.

SEASONAL DATA: Only immature specimens have been collected in nature. These, taken from May through September, have molted to maturity from September through December.

REMARKS: *Andreaannae* is structurally similar to *Ebo magnificus* (Chamberlin and Ivie, 1942) described from Utah. *Andreaannae* differs in the following respects in the male palpus: the cymbium and bulb are narrower, the embolus and conductor are slightly longer, the tibia is longer than the cymbium (shorter in *magnificus*), and the distal tooth of the RTA is narrower.

Ebo andreaannae is named for my daughter, Andrea Ann Schick.

Dispar GROUP

Male palpus: Bulb proportionately less elongate than that in the *macyi* group, 1.3–1.4 times as long as broad. Embolar arch more elongate and much broader than in *macyi* group, width equal to about three-fourths of length of tegulum. Receptaculum: Intromittent division extending beneath entire spermatheca; spermathecal organ origi-

nating at mesial margin of intromittent division.

Ebo (Titanebo) dispar, new species

FEMALE: Length 5.5 mm.

Facies usually similar to that of *macyi*, but lateral and paramedial stripes in some cases not distinct and dorsum of abdomen invested with gold-colored scales.

Femur II length index 1.9–2.1.

Receptaculum as shown in figure 105.

MALE: Length 5.5 mm.

Facies similar to that of *macyi*. Femur II length index 2.5.

Palpus (fig. 104): Length of bulb 0.72–0.75 mm., only 1.3–1.4 times as long as broad. Tegular suture at a distance of from one-fourth to three-eighths of length of tegulum from proximal margin of tegulum. Conductor length index 7.6–8.0, but in three of the four known specimens, 7.9 or 8.0. Tibial length index 13–15.

TYPE: Holotype, male, Little Rock, Los Angeles County, California, August 19, 1956 (maturation date in laboratory, December 31, 1956), R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 15).

SEASONAL DATA: Only one mature individual has been taken in nature, a male in October. Reared forms have matured from September through January.

SUBGENUS *EBO* KEYSERLING

TYPE: *Ebo latithorax* Keyserling, 1884.

Clypeus relatively narrow, at most only slightly higher than the AME interdistance. Tibial and basitarsal spiniformation reduced, prolateral elements lacking, legs in some cases completely devoid of spiniforms; telotarsi thinly scopulate. Male palpus: Embolus short, without an abruptly narrowed apical portion; retrolateral conductor groove not apparent. VTA reduced.

Ebo (Ebo) pepinensis Gertsch

Ebo pepinensis GERTSCH, 1933c, pp. 1–2.

FEMALE: Average length about 4.0 mm.

Allatum comprising irregular maculae. Legs without a stripe; tibia I, 0-2-0; basitarsus I, 0-2-0; femur II length index 1.6–1.7.

Abdomen pale to dark gray, with pale to



MAP 16. Distributions of *Ebo pepinensis* Gertsch and *E. merkeli*, new species.

dark markings; cardiac mark and paramedial stripe in some indistinct (in which case dorsum of abdomen with a few bilateral dark spots representing remnants of the markings, a posteriolateral pair the most prominent).

Epigynum as shown in figure 95; receptaculum, as in figure 94.

MALE: Average length about 2.5 mm.

Markings and coloration similar to those of female. Femur II length index only 1.4–1.5.

Palpus (fig. 96): Embolus shorter and more weakly sclerotized, and middle loop of reservoir shorter than that of *merkei*.

TYPE: Holotype, male, Wacouta Beach, Lake Pepin, Minnesota, May 15, 1932, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: California (map 16); Indiana; Illinois; Minnesota.

SEASONAL DATA: Mature males have been taken from April through June; females, from May through August. A penultimate female taken in April molted to maturity shortly afterward in the same month, and one collected in August matured in September.

Ebo (*Ebo*) *merkei*, new species

MALE: (Based on holotype). Length 2.25 mm.

Body pale, lacking distinct markings. Patellae, tibiae, and basitarsi with a conspicuous, narrow, dark, middorsal stripe; tibiae and basitarsi lacking distinct spiniforms; femur II length index 2.0.

Palpus (fig. 99): Embolus longer and more strongly sclerotized than that of *pepinensis*; middle loop of reservoir more elongate than that in *pepinensis*. Distal tooth of RTA broader than that of *pepinensis*.

TYPE: Holotype, male, Borrego Valley, San Diego County, California, October 12, 1957, D. E. Merkel, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 16).

REMARKS: *Merkeli* resembles the eastern *latithorax* in the extreme length of the second pair of legs and in the leg markings.

TRIBE THANATINI, NEW TRIBE

Posterior eye row typically strongly recurved, recurvature index usually greater than 1.5; PME typically more closely ap-

proximated than that in the Philodromini, interdistance index usually less than 1.2. Male palpus: PCA absent; tegular suture absent. Receptaculum: Elongate duct of spermathecal organ present.

The VTA of the thanatine male palpus shows an interesting range of variation. The VTA of *Apollophanes* is an elongate membranous lobe; in the subgenus *Horodromus* the VTA is contiguous with the RTA along its entire length, but in the subgenus *Apollophanes* the VTA and RTA are separated apically. The VTA of *Pelloctanes* is similar to that of *Horodromus* but reduced in size. The VTA of *Thanatus* may be represented by: (1) a small, weakly sclerotized hump situated on a strongly developed RTA (*formicinus* group), (2) a low sclerotized ridge somewhat more strongly produced at the ventral end (*peninsulanus* group), or (3) a hammock-like, membranous area situated between a secondary VTA and the RTA (*striatus* group). The secondary VTA of the *striatus* group is possibly homologous to the produced ventral end of the ridge of the *peninsulanus* group. The apophysis is rudimentary in *Tibellus*.

GENUS APOLLOPHANES O. PICKARD-CAMBRIDGE

Apollophanes O. PICKARD-CAMBRIDGE, 1898, p. 252. F. PICKARD-CAMBRIDGE, 1900, p. 131. GERTSCH, 1933a, p. 13.

Horodromus CHAMBERLIN, 1924, p. 653. Synonymy by Gertsch (*in litt.*)

TYPE: Of *Apollophanes*, *Tibellus punctipes* O. Pickard-Cambridge, 1891. Of *Horodromus*, *Horodromus absolutus* Chamberlin, 1924.

Carapace as long as broad or slightly longer than broad, length-breadth ratio at most 1.1/1. PME interdistance index 1.0–1.1; posterior eye recurvature index 1.5–2.5. Telotarsi thinly scopulate; basitarsus I with a proapical spiniform. Male palpus: Embolus originating on prolateral side of tegulum, not spirally ridged; VBA present; VTA an elongate lobe; RTA well developed. Epigynum: Intromittent orifice large, funnel-like, situated beneath posterior half of spermatheca; guide pockets absent; epigynal sutures converging caudally. Receptaculum: Bursa copulatrix entering spermatheca ventrally in anterior half; spermatheca without numerous internal pits; spermathecal organ situated cephalad of spermatheca; duct of sperma-

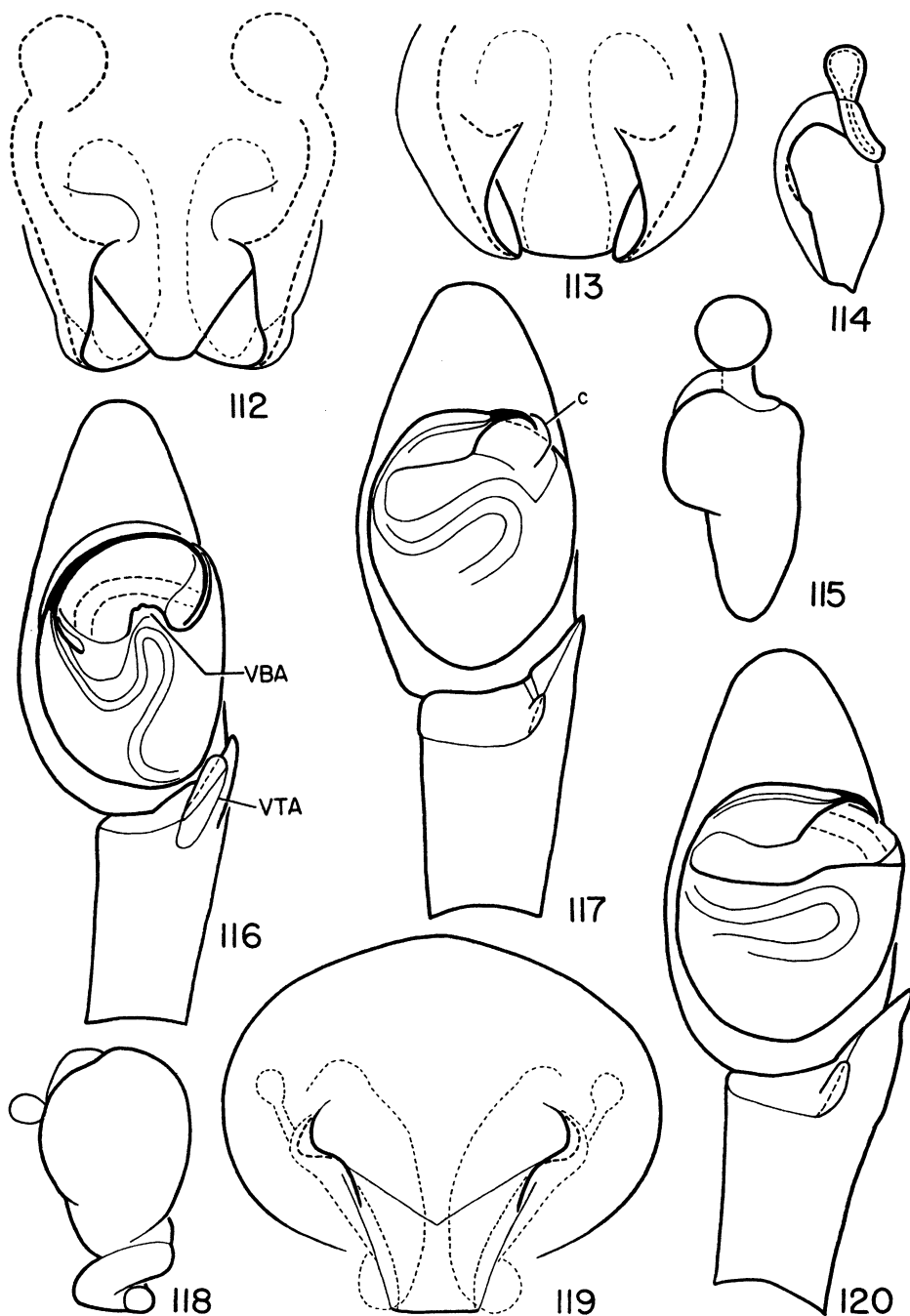


FIG. 112. *Apollophanes francesca* Lowrie and Gertsch, epigynum.

FIGS. 113, 114. *Apollophanes texana* Banks. 113. Epigynum. 114. Receptaculum, dorsal view.

FIG. 115. *Apollophanes francesca* Lowrie and Gertsch, receptaculum, dorsal view.

FIG. 116. *Apollophanes texana* Banks, male palpus, ventral view.

FIGS. 117-120. *Pellocctanes margareta* (Lowrie and Gertsch). 117, 120. Male palpi, ventral view. 118. Receptaculum, dorsal view. 119. Epigynum.

Abbreviation: c, conductor.

thecal organ not free, contained within body of receptaculum.

KEY TO THE SPECIES OF *Apollophanes*
IN CALIFORNIA

Males: Length of bulb 0.66 mm. (one specimen).
Females: Spermathecal organs prominent, as seen through epigynal integument (fig. 112). Bursa copulatrix apparent only anteriolateral to spermatheca as seen dorsally (fig. 115; requires dissection). Distribution: One known record, southern Sierra Nevada (map 17) *francesca*

Males: Length of bulb 0.48–0.54 mm. Females: Spermathecal organs not discernible through epigynal integument (fig. 113). Bursa copulatrix broadly developed about lateral and anterior margins of spermatheca (fig. 114; requires dissection). Distribution: Californian, Sonoran, and Great Basin provinces; also Kernian District (map 17) *texana*

SUBGENUS *HORODROMUS* CHAMBERLIN

TYPE: *Apollophanes texana* Banks, 1904.

Two subgenera of *Apollophanes* can be recognized in the United States, *Apollophanes* and *Horodromus*. The latter subgeneric name is referred to the genus *Apollophanes* based on the synonymy of the genotype of *Horodromus*, *H. absolutus*, with *A. texana*. The two subgenera may be contrasted as follows: in *Apollophanes* the eyes are smaller than is usual in *Horodromus*, the ALE are subequidistantly spaced between the AME and the PME, the posterior eye recurvature index (2.5) is greater than is usual in *Horodromus*, the body tends to be more elongate (even rivaling *Tibellus*), and the embolus is relatively shorter. In *Horodromus* the ALE are closer to the AME than the PME, the recurvature index is usually 1.5–2.0, and the body is not particularly elongate. *Apollophanes arizonensis* Gertsch, 1933 (= *similalis* Gertsch, 1933), belongs to the subgenus *Apollophanes*.

Apollophanes (Horodromus) texana Banks

Apollophanes texana BANKS, 1904b, p. 113, pl. 5, fig. 12, pl. 6, fig. 20.

Horodromus absolutus CHAMBERLIN, 1924, p. 653, fig. 49. Synonymy by Gertsch (*in litt*).

FEMALE: Average length 6.5–7.0 mm.

Femur II length index 1.3–1.4. Dorsum of abdomen with plaques of bronze-colored scales at base of spiniforms.

Epigynum as shown in figure 113.

Receptaculum (fig. 114): Bursa copulatrix visible dorsally along lateral and anterior margins of spermatheca; diameter of spermathecal organ less than twice that of the duct; spermatheca smaller than that of *francesca*.

MALE: Average length about 5.0 mm.

Facies similar to that of female.

Palpus (fig. 116): Length of bulb 0.48–0.54 mm. (six specimens).

TYPES: Syntypes, male and female, San Antonio, Texas, in the Museum of Comparative Zoölogy.

DISTRIBUTION: Desert areas of western United States into Montana. The distribution in California is shown in map 17.

SEASONAL DATA: Mature forms have been taken from February through October, the majority from May through July.

Apollophanes (Horodromus) francesca
Lowrie and Gertsch

Apollophanes francesca LOWRIE AND GERTSCH, 1955, pp. 15–16, figs. 6–8.

FEMALE: (Based on allotype and paratype). Length 8.0–9.0 mm.

Specimens with all scales rubbed off. Femur II length index 1.2–1.3.

Epigynum as shown in figure 112.

Receptaculum (fig. 115): Bursa copulatrix visible dorsally only at anteriolateral margin of spermatheca; spermathecal organ about twice the diameter of the duct; spermatheca larger than that in *texana*.

MALE: (Based on holotype). Length 6.5 mm.

Palpus: Similar to that of *texana* but more elongate; bulb longer, length 0.66 mm.

TYPES: Holotype, male*, allotype, female*, Cedar Grove, 4633 feet, Kings River Canyon, Fresno County (*nec* Tulare County), California, July 16, 1952, M. Cazier, W. J. Gertsch, R. Schrammel, in the American Museum of Natural History.

DISTRIBUTION: Known only from the type locality, Cedar Grove, a Yellow Pine Forest community in which there are chaparral elements (map 17).

GENUS *PELLOCTANES*, NEW GENUS

TYPE: *Apollophanes margareta* Lowrie and Gertsch, 1955.

Carapace as long as broad or slightly



MAP 17. Distributions of *Apollophanes texana* Banks and *A. francesca* Lowrie and Gertsch.

longer than broad, length-breadth ratio at most 1.1/1. PME interdistance index 1.3–1.4; posterior eye recurvature index 1.0 or less. Telotarsi densely scopulate; basitarsus I lacking a proapical spiniform. Male palpus: Embolus arising at distal end of tegulum, not spirally ridged; VBA absent. VTA similar in form to that of *Apollophanes* but smaller; RTA well developed. Epigynum: Intromittent orifice funnel-like, prominent, but not so large as that of *Apollophanes*, situated beneath anterior half of spermatheca; guide pockets absent; epigynal sutures converging caudally. Receptaculum: Bursa copulatrix entering spermatheca on anterior half and ventral side of latter; spermatheca with numerous small internal pits; spermathecal organ situated lateral to spermatheca; duct of spermathecal organ free, shorter than that of *Tibellus*.

Pelloctanes is a monotypic genus which, of Nearctic genera, shows similarities to *Apollophanes* and *Thanatus*, but it also has unique features. The tibia of the male palpus is *Apollophanes*-like in that the segment is relatively elongate and the VTA erect (although somewhat reduced). However, this condition appears to be a primitive one for the tribe. The bulb is *Thanatus*-like in that the embolus arises at 0 degrees. The epigynum is *Apollophanes*-like in the caudally converging epigynal sutures and funnel-like intromittent orifices (but smaller than that of *Apollophanes*) but *Thanatus*-like in that the orifices are situated over the anterior half of the spermathecae. The receptaculum is *Apollophanes*-like in the fact that the entrance of the bursa copulatrix is ventral, on the anterior half of the spermatheca; *Thanatus*-like in that the duct of the spermathecal organ is free; and unique in the location of the latter, lateral to the spermatheca, and the presence of numerous minute pits in the spermatheca. The eye arrangement is almost unique for the Thanatini: the PME are widely spaced and only very slightly recurved. This arrangement is also the case in *Apollophanes patriciae* Lowrie and Gertsch (Dondale, *in litt.*), but *patriciae* should probably be referred to another genus. Dondale also points out that the anterior eyes of *Pelloctanes margareta* are subequal in size which is the case in *Apollophanes*. The dense telotarsal scopulation and lack of a pro-

apical spiniform in *Pelloctanes* are characters shared with *Thanatus*. Finally the distributions of the species of *Apollophanes* are primarily austral, whereas those of *Pelloctanes margareta* and most of those of *Thanatus* are boreal.

From the above discussion, concerning presumably significant characters, it can be seen not only that it would be arbitrary to place *margareta* in either *Apollophanes* or *Thanatus*, but that this species is characteristic in its own right. Hence it appears proper to erect a separate genus for *margareta*. (It should be noted that, although I have compared *Pelloctanes* to *Apollophanes* and *Thanatus*, I am not suggesting that *Pelloctanes* is necessarily derived from either of these genera.)

The name *Pelloctanes*, from the Greek *pellos*, "dusky," plus *klanēs*, "killer" (Brown, 1956), refers to the dark coloration and disposition of the type species.

Pelloctanes margareta (Lowrie and Gertsch),
new combination

Apollophanes margareta LOWRIE AND GERTSCH,
1955, pp. 16–18, figs. 10–12.

FEMALE: Average length 8.5–9.0 mm.

Body and legs robust, general coloration brown or dark gray to black; carapace and abdominal setae rather slender. Metadiscus dark. Femur II length index 1.3–1.4.

Epigynum as shown in figure 119.

Receptaculum as shown in figure 118.

MALE: Average length about 6.0 mm.

Markings and coloration similar to those of female.

Palpus (figs. 117, 120): Tegulum variable in form, ventrally rotund and only slightly projecting from the cymbium distiretro-laterad (fig. 117), or more flattened and strongly produced distiretrolaterad (fig. 120), the latter condition usually correlated with a dark body coloration.

TYPE: Holotype, male, Thompson Falls, Montana, June 26–30, 1950, B. Malkin, in the American Museum of Natural History.

DISTRIBUTION: Western United States. The distribution in California is shown in map 18.

ECOLOGY: *Margareta* has been taken only on *Juniperus* outside the montane forests. This crab spider is a principal constituent of



MAP 18. Distribution of *Pelloctanes margareta* (Lowrie and Gertsch).

an impoverished spider fauna of the juniper woodland communities of California.

SEASONAL DATA: Mature forms have been taken in June and July, but, judged from rearing data, maturation may occur as early as April.

GENUS *THANATUS* C. L. KOCH

Thanatus C. L. KOCH, 1837, p. 28. SIMON, 1895, p. 1064.

TYPE: *Araneus formicinus* Clerck.

Carapace as long as broad or slightly longer than broad, length-breadth ratio at most 1.1/1. PME interdistance index 0.98–1.2; posterior eye recurvature index 1.5–2.5. Telotarsi densely scopulate; basitarsus I lacking a proapical spiniform. Male palpus: Embolus arising at distal end of tegulum, not spirally ridged; VBA present. VTA variable in form, greatly reduced; RTA well developed. Epigynum: Intromittent orifice small, situated beneath anterior margin of spermatheca; guide pockets present; epigynal sutures usually more or less parallel, in some cases converging caudally but not so markedly so as in other thanatine genera. Receptaculum: Bursa copulatrix entering spermatheca on anterio-mesial side; spermatheca lacking internal pits; spermathecal organ situated anterior to spermatheca; duct of spermathecal organ free, typically quite short.

Three groups can be recognized in this subgenus in the Nearctic region (*peninsulanus*, *striatus*, and *formicinus*). The first two are monotypic.

KEY TO THE SPECIES OF *Thanatus*
IN CALIFORNIA

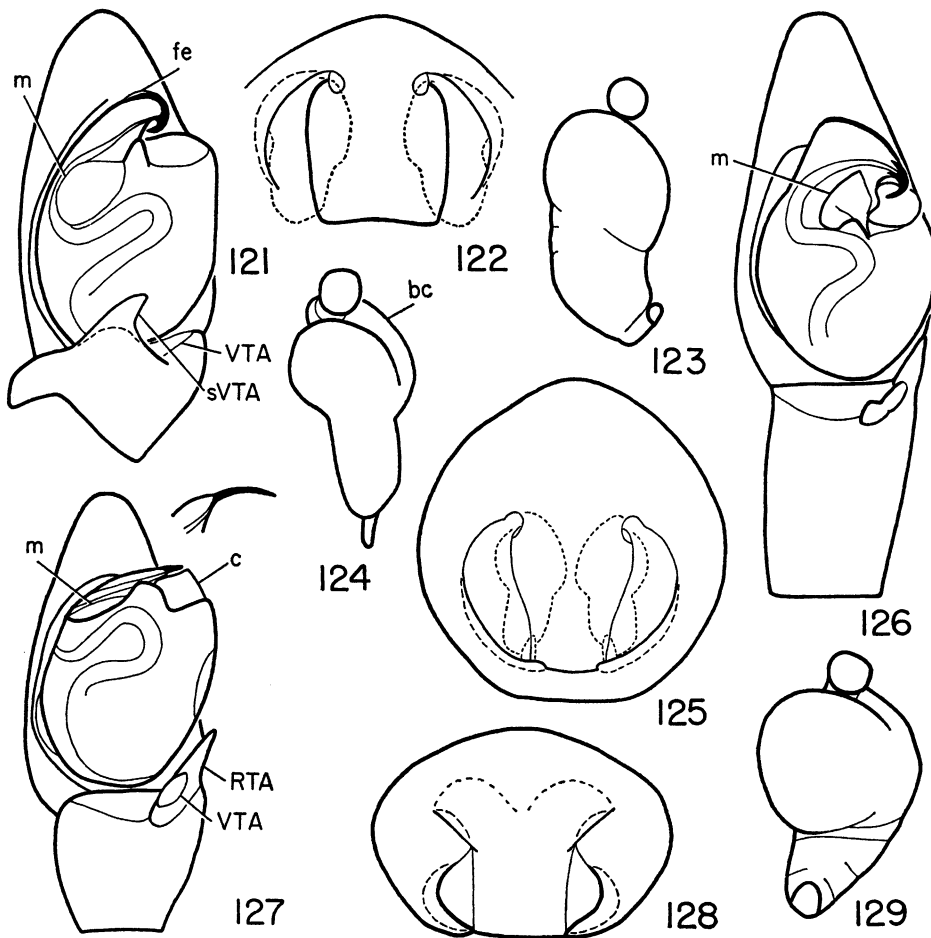
Males

1. Distal margin of tegulum produced into a strong and angulate apophysis the retrolateral margin of which is strongly sclerotized (fig. 126) *peninsulanus*
Tegulum not so produced 2
- 2(1). Secondary VTA well developed (sVTA), embolus strongly recurved apically, forming an arc of about 180 degrees (fig. 121) *striatus*
Secondary VTA not developed; embolus only slightly curved 3
- 3(2). Cymbium subequal in length to palpal femur; origin of embolus on tegulum indicated by a slight distal emargination

- (fig. 127, insert) *altimontis*
Cymbium longer than femur; distidorsal margin of tegulum evenly continuous with embolus 4
- 4(3). Embolus longer than width of tibia (as seen prolaterally); RTA at marked angle to retrolateral face of tibia (fig. 141) *coloradensis*
Embolus shorter than width of tibia (as seen prolaterally); RTA more nearly parallel to retrolateral face of tibia (fig. 139) *formicinus*

Females

1. Tibia I with three prolateral spiniforms; basitarsus I with one prolateral spiniform (absent from some). Epigynal suture indistinct owing to lack of pigmentation of epigynum and spermathecal apodeme; lateral guide pocket shallow and elongate (fig. 125) *peninsulanus*
Tibia I with one prolateral spiniform or none; basitarsus I with no prolateral spiniforms. Epigynal suture distinct; lateral guide pocket deeper, pouchlike . 2
- 2(1). Proventral spiniform 2 of basitarsus I situated in basal half of segment; femur II length index 0.9. Central division of epigynum membranous (fig. 122) . . . *striatus*
Proventral spiniform 2 of basitarsus I situated in distal half of segment; femur II length index 1.1–1.2. Central division of epigynum sclerotized 3
- 3(2). Carapace with conspicuous vestiture of white scales; posterior eye row less strongly recurved, recurvature index less than 2.0. Median septum of epigynum not apparent; margin of hood usually more strongly concave (fig. 128). Anterior portion of spermatheca globose (dissection required; fig. 129) *altimontis*
Carapace usually without conspicuous vestiture of white scales; posterior eye row more strongly recurved, recurvature index about 2.0 or greater. Median septum of epigynum apparent as a somewhat indistinct, flat, membranous structure; margin of hood usually less strongly concave (fig. 140). Anterior portion of spermatheca squared (requires dissection; figs. 142, 143) 4
- 4(3). Duct of spermathecal organ prominent from dorsal view (requires dissection; fig. 143) *coloradensis*
Duct of spermathecal organ essentially hidden in a dorsal view (requires dissection; fig. 142) *formicinus*



FIGS. 121-123. *Thanatus striatus* C. L. Koch. 121. Male palpus, ventral view. 122. Epigynum. 123. Receptaculum, dorsal view.

FIGS. 124-126. *Thanatus peninsulanus* Banks. 124. Receptaculum, dorsal view. 125. Epigynum. 126. Male palpus, ventral view.

FIGS. 127-129. *Thanatus altimontis* Gertsch. 127. Male palpus, ventral view. 128. Epigynum. 129. Receptaculum, dorsal view.

Abbreviations: bc, bursa copulatrix; c, conductor; fe, flange on embolus; m, membranous area; sVTA, secondary VTA.

Peninsulanus GROUP

Femur II length index of female 1.4; tibia I of female with three prolateral spiniforms. Male palpus: Tegulum with a broad, prolateral, sclerotized strip delimited retrolaterally by a membranous area (fig. 126, m). RTA reduced, not strongly sclerotized; primary VTA developed as a narrow, dorso-ventral, sclerotized ridge slightly more strongly produced at ventral end; secondary

VTA absent. Epigynum: Central division membranous; lateral guide pocket situated in posterior portion of epigynum, laterocaudally to spermatheca, but not reaching posterior margin of epigynum. Receptaculum: Spermathecal apodeme membranous; spermatheca lacking transverse seams.

Thanatus peninsulanus Banks

Thanatus peninsulanus BANKS, 1898, p. 265, pl. 16, fig. 11.

Thanatus retentus CHAMBERLIN, 1919, p. 9, pl. 6, fig. 5. Synonymy with *peninsulanus* by Gertsch (1935).

FEMALE: Average length about 7.5 mm.

General coloration pale brown; primary carapace and dorsal erect abdominal setae, especially posterior carapace elements, not strongly spiniform. Carapace without a conspicuous vestiture of white scales. Tibia I, 3-2-1; basitarsus I, 1-2-0 or 0-2-0, proventral spiniform 2 situated in basal half of segment. Paramedial stripes forming V-shaped marking on caudal half of abdomen.

Epigynum (fig. 125): Largely membranous, epigynal suture indistinct; guide pocket shallow and elongate.

Receptaculum (fig. 124): Spermatheca rather slender.

MALE: Average length about 4.5 mm.

Palpus (fig. 126): Length of bulb 0.46–0.54 mm. (in one rather large Arizonan specimen 0.66 mm.). Distal margin of tegulum strongly produced as a large and somewhat angulate apophysis the retrolateral margin of which is heavily sclerotized. Femur longer than cymbium.

TYPES: Female, syntype of *peninsulanus*, from San José del Cabo, Cape region of Baja California, in the California Academy of Sciences, possibly destroyed. Holotype, male, of *retentus*, from Claremont, California, in the Museum of Comparative Zoölogy (M.C.Z. No. 389).

DISTRIBUTION: California (map 19); desert areas of southwestern United States and Baja California; Massachusetts (Kaston, 1948). Gertsch (*in litt.*) suggests that *peninsulanus* has been introduced by man into Massachusetts. Dondale (*in litt.*) considers *peninsulanus* a synonym of the Palearctic *Thanatus vulgaris* Simon. If this is so, and I am inclined to agree with this interpretation, this species probably should not be classified as part of the Sonoran element as is done in the Analysis of the Distribution section above.

SEASONAL DATA: Mature forms have been taken from April through November.

Striatus GROUP

Femur II length index of female 0.9; tibia I female with one prolateral spiniform or none. Male palpus: Tegulum with a narrow, pro-

lateral, sclerotized strip delimited retrolaterally by a membranous area (fig. 121, m). RTA reduced, not strongly sclerotized; primary VTA developed as a shallow membranous area between RTA and secondary VTA; secondary VTA present (fig. 121, sVTA). Epigynum: Central division membranous; lateral guide pocket situated in anterior portion of epigynum, cephalolateral to spermatheca. Receptaculum: Spermathecal apodeme sclerotized; spermatheca lacking conspicuous transverse seams.

Thanatus striatus C. L. Koch

Thanatus striatus C. L. KOCH, 1845, p. 92, pl. 417, fig. 1022.

FEMALE: Average length about 5.0 mm.

General coloration grayish brown; primary carapace and dorsal, erect, abdominal setae fine, not spiniform. Carapace without a prominent vestiture of white scales. Tibia I, 1-2-1 to 0-2-0; basitarsus I, 0-2-0, proventral spiniform 2 situated in basal half of segment. Dorsum of abdomen with two pairs of somewhat indistinct stripes, the stripes of each side joined by oblique strands.

Epigynum (fig. 122): Structure somewhat obscure, spermathecal apodeme, visible through epigynal integument, the most prominent feature.

Receptaculum as shown in figure 123.

MALE: Average length about 3.5 mm.

Palpus (fig. 121): Length of bulb 0.39–0.48 mm. Embolus short and stout, more strongly curved than in other species, with a narrow ectal flange (f) at base. Cymbium subequal in length to femur.

TYPE: Holotype, female, Germany, in the British Museum (Natural History).

DISTRIBUTION: Holarctic. Alaska, Canada, northeastern and western boreal United States. The distribution in California is indicated in map 19.

ECOLOGY: Based on the one Californian record, immatures were found to be abundant by sweeping through a marshy area in the Sierran District (July).

Formicinus GROUP

Femur II length index of female 1.0–1.2; tibia I of female lacking prolateral spiniforms. Male palpus: Distal membranous area (fig. 127, m) reaching prolateral margin of tegu-



MAP 19. Distributions of *Thanatus peninsulanus* Banks, *T. striatus* C. L. Koch, *T. altimontis* Gertsch, *T. formicinus* (Clerck), and *T. coloradensis* Keyserling.

lum. RTA well developed, strongly sclerotized; primary VTA developed as a pale hump on ventrobasal face of RTA; secondary VTA absent. Epigynum: Central division sclerotized; lateral guide pocket situated in posterior portion and reaching posterior margin of epigynum. Receptaculum: Spermathecal apodeme sclerotized; posterior portion of spermatheca with distinct transverse seams.

***Thanatus altimontis* Gertsch**

Thanatus altimontis GERTSCH, 1933b, p. 6, figs. 2, 48.

FEMALE: Average length about 6.0 mm.

General coloration in alcohol brownish, in some cases quite pale; primary carapace and dorsal, erect, abdominal setae spiniform. Carapace with a prominent vestiture of white scales; posterior eyes less strongly recurved than those of *coloradensis* or *formicinus*, PE recurvature index less than 2.0. Femur II length index 1.0–1.1; tibia I, 1-2-1 or 1-2-0; basitarsus I, 0-2-0, proventral spiniform 2 situated in distal half of segment.

Epigynum (fig. 128): Membranous septum over epigynal suture lacking; margin of hood of lateral guide pocket more strongly concave than usual in *coloradensis* or *formicinus*, and deeper.

Receptaculum (fig. 129): Spermatheca not so robust as that in *coloradensis* or *formicinus*, anterior portion globose; duct of spermathecal organ short, not apparent dorsally.

MALE: Average length 4–5 mm.

Palpus (fig. 127): Length of bulb 0.42–0.51 mm., usually close to 0.50 mm. Embolus shorter and stouter than that of *formicinus*, delimited from distal margin of tegulum by a slight emargination (fig. 127, insert). Outer face of RTA nearly parallel to retrolateral face of tibia. Cymbium subequal in length to femur.

TYPES: Holotype, male*, allotype, female*, Smith's Fork Canyon, Cokeville, Wyoming, August 21, 1931, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Boreal areas of northern Pacific coast and Rocky Mountain states southward into desert areas of California and Arizona. The distribution in California is indicated on map 19.

ECOLOGY: Specimens in the Mojavian District were collected under rocks.

SEASONAL DATA: Mature females have been taken from May through August.

***Thanatus formicinus* (Clerck)**

Araneus formicinus CLERCK, 1758, p. 134.

Thanatus formicinus: C. L. KOCH, 1837, p. 28.

FEMALE: Average length about 6.0 mm.

General coloration brownish in alcohol; primary carapace and dorsal abdominal setae spiniform. Carapace usually without a prominent vestiture of white scales; posterior row of eyes more strongly recurved than those of *altimontis*, PE recurvature index about 2.0 or greater. Femur II length index 1.1–1.2; tibia I, 1-2-1 to 0-2-0; basitarsus I, 0-2-0, proventral spiniform 2 situated in distal half of segment.

Epigynum (fig. 140): Epigynal suture covered anteriorly by a membranous flap; margin of hood of lateral guide pocket usually less strongly concave than in *altimontis* and shallower.

Receptaculum (fig. 142): Spermatheca robust, angulate anteriorly; only tip of duct of spermathecal organ visible dorsally.

MALE: (Based upon two specimens). Length 4.5–4.75 mm.

Palpus (fig. 139): Length of bulb 0.57 mm. Embolus slender and elongate, shorter than that of *coloradensis* but longer than that in other species; distal margin of tegulum and embolus evenly continuous. Outer face of RTA nearly parallel to retrolateral face of tibia. Cymbium longer than femur.

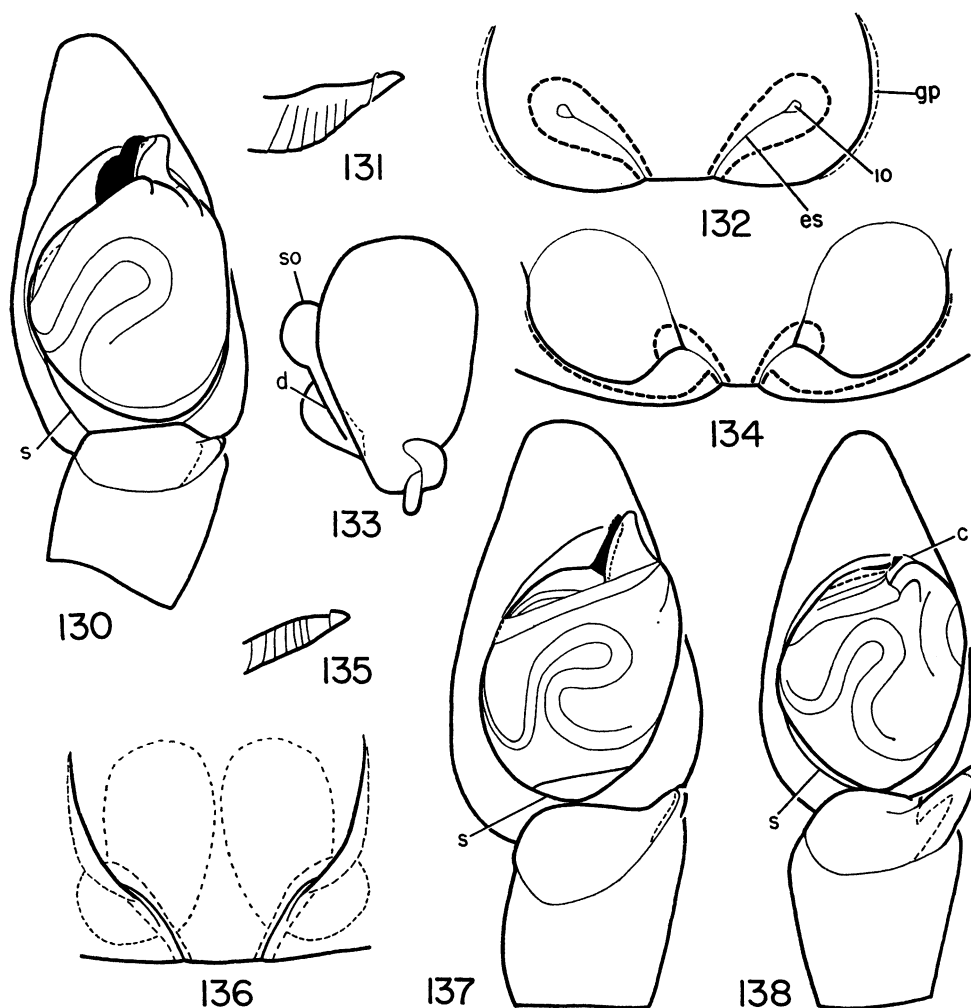
TYPE: Holotype, female, Sweden.

DISTRIBUTION: Holarctic. Canada, northern United States, Rocky Mountain states into California. The distribution in California is shown in map 19.

ECOLOGY: *Formicinus*, in the Californian Province, has been collected only in grass or on the ground in Coastal Oak Woodland.

SEASONAL DATA: Mature forms have been taken from February through May, the majority in March.

REMARKS: All the Californian specimens of *formicinus* are smaller than those examined from Canada and eastern United States. However, the only Rocky Mountain specimen I have seen is the same size as the Californian forms. Surprisingly, *formicinus* has not been taken in boreal areas in California.



FIGS. 130-132. *Tibellus chamberlini* Gertsch. 130. Male palpus, ventral view. 131. Teguloembolar unit, prolateral view. 132. Epigynum.

FIGS. 133, 134. *Tibellus oblongus* (Walckenaer). 133. Receptaculum, dorsal view. 134. Epigynum.

FIGS. 135, 136. *Tibellus rothi*, new species. 135. Teguloembolar unit, prolateral view. 136. Epigynum.

FIG. 137. *Tibellus oblongus* (Walckenaer), male palpus, ventral view.

FIG. 138. *Tibellus californicus*, new species, male palpus, ventral view.

Abbreviations: c, conductor; d, duct of spermathecal organ; es, epigynal suture; gp, guide pocket; io, intromittent orifice; s, subtegulum; so, spermathecal organ.

***Thanatus coloradensis* Keyserling**

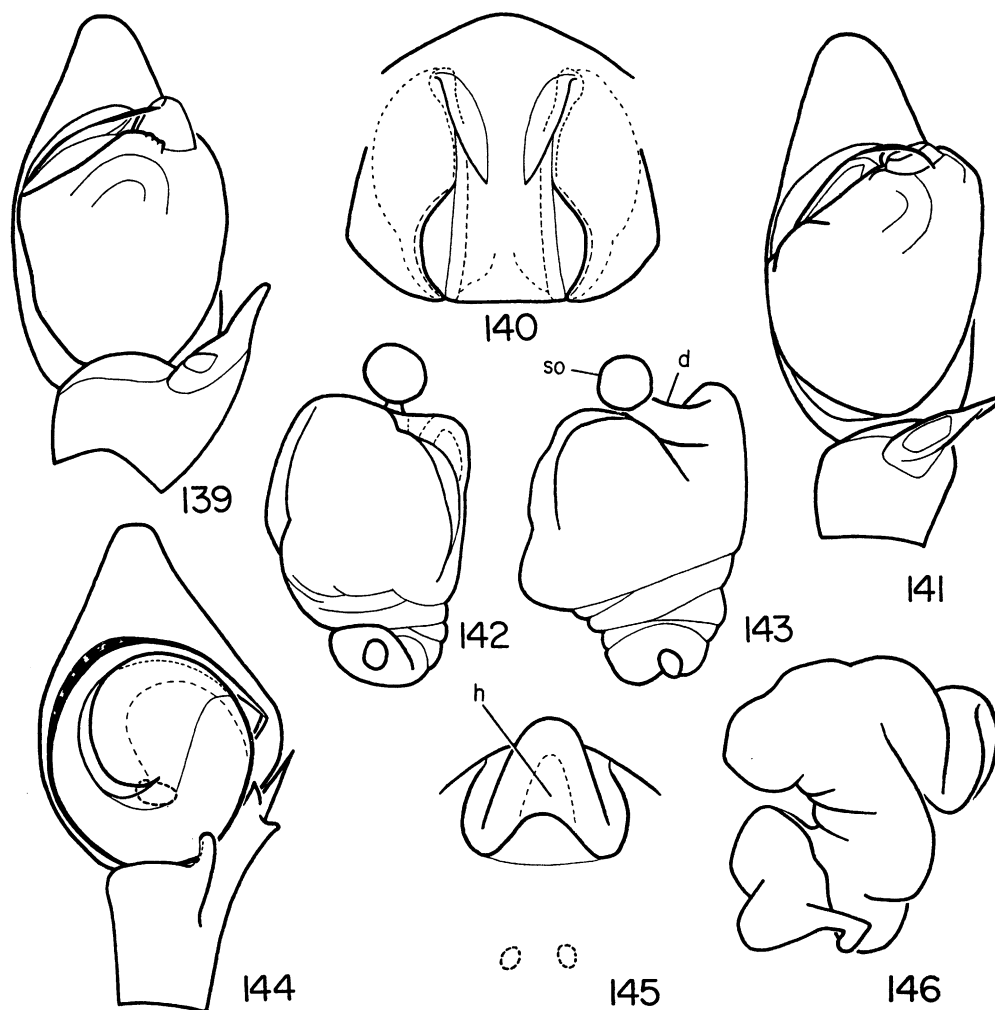
Thanatus coloradensis KEYSERLING, 1880, pp. 206-207, pl. 5, fig. 113. GERTSCH, 1933b, p. 1.

FEMALE: Average length about 8.0 mm.

General coloration in alcohol brownish, in some cases quite pale; primary carapace and dorsal erect abdominal setae spiniform. Carapace without a prominent vestiture of white

scales; posterior eyes more strongly recurved than those of *altimontis*, PE recurvature index about 2.0 or more. Femur II length index 1.1-1.2; tibia I, 1-2-1 to 0-2-0; basitarsus I, 0-2-0, proventral spiniform 2 situated in distal half of segment.

Epigynum: Similar to that of *formicinus* but larger.



FIGS. 139, 140. *Thanatus formicinus* (Clerck). 139. Male palpus, ventral view. 140. Epigynum.

FIG. 141. *Thanatus coloradensis* Keyserling, male palpus, ventral view.

FIG. 142. *Thanatus formicinus* (Clerck), receptaculum, dorsal view.

FIG. 143. *Thanatus coloradensis* Keyserling, receptaculum, dorsal view.

FIGS. 144–146. *Diaea pictilis* (Banks). 144. Male palpus, ventral view. 145. Epigynum. 146. Receptaculum, dorsal view.

Abbreviations: d, duct of spermathecal organ; h, hood; so, spermathecal organ.

Receptaculum (fig. 143): Similar to that of *formicinus*, but duct of spermathecal organ longer and visible in its entirety from a dorsal aspect.

MALE: (Based on two extralimital specimens). Length 6.0–6.5 mm.

Palpus (fig. 141): Length of bulb 0.75–0.84 mm. Embolus slender and elongate, longer than that of other species of the genus, distal

margin of tegulum and embolus evenly continuous. Outer face of RTA at a marked angle to retrolateral face of tibia. Cymbium longer than femur.

TYPES: Syntypes, male, immature females, Colorado (Simon collection, Museum National d'Histoire Naturelle).

DISTRIBUTION: Holarctic. Canada and western boreal United States, spilling over into

the margins of the Great Basin. The distribution in California is shown in map 19.

SEASONAL DATA: Two females have been taken in May. An immature female collected in June matured the following November.

GENUS *TIBELLUS* SIMON

Tibellus SIMON, 1875, p. 307; 1895, p. 1065. GERTSCH, 1933a, p. 2.

TYPE: *Aranea oblonga* Walckenaer, 1802.

Carapace usually markedly longer than broad, length-breadth ratio as little as 1.1/1, but usually greater. PME interdistance index 0.83 or less; posterior eye recurvature index 3.0 or greater. Telotarsi densely scopulate; basitarsus I lacking a proapical spiniform. Male palpus: Embolus arising at distal end of tegulum, spirally ridged; VBA present. VTA rudimentary; RTA reduced. Epigynum: Intromittent orifice small, situated beneath posterior end of spermatheca; guide pockets present; epigynal sutures converging caudally. Receptaculum: Bursa copulatrix entering spermatheca in posterior half of latter; spermatheca lacking small internal pits; spermathecal organ situated lateral to spermatheca, duct long and free of receptaculum.

Tibellus comprises a distinct group of elongate crab spiders the legs of which parallel the axis of the body. The body markings are characteristic: a dorsomedial stripe extends from the anterior portion of the carapace to the end of the abdomen (on the carapace the metadiscus is pigmented only in its central portion, forming a segment of the stripe), and one or two pairs of caudodorsal spots are present on the abdomen lateral to the medial stripe.

KEY TO THE SPECIES OF *Tibellus* IN CALIFORNIA

1. Tibia I, 3-2-1 2
- Tibia I, 3-3-1 4
- 2(1). Females¹ *oblongus*
- Males 3
- 3(2). Teguloembolar unit prominent, elongate (fig. 137); part of subtegulum visible ventrally broad and situated at proximal margin of tegulum(s) *oblongus*
- Teguloembolar unit relatively inconspicuous (fig. 138); part of subtegulum visible ventrally more narrowly produced and situated at proximal prolateral margin of

- tegulum(s) *californicus*
- 4(1). Females 5
- Males 6
- 5(4). Epigynum broad, width at least 0.54 mm.; intromittent orifice situated well mesiad of guide pocket (fig. 132) *chamberlini*
- Epigynum narrower, width 0.39–0.48 mm.; intromittent orifice situated next to or in guide pocket (fig. 136) *rothi*
- 6(4). Teguloembolar unit, as seen prolaterally, cylindrical (fig. 135) *rothi*
- Teguloembolar unit, as seen prolaterally, swollen basally (fig. 131) *chamberlini*

Tibellus californicus, new species

FEMALE: Unknown.

MALE: (Based on two specimens). Length 5.5 mm.

Carapace 1.1–1.2 times as long as broad. Femur II length index 1.2–1.3; tibia I, 3-2-1.

Palpus (fig. 138): Teguloembolar unit small, inconspicuous, not spirally ridged basally, apically with a spiral ridge of one turn; subtegulum only narrowly produced from beneath tegulum, visible at proximal prolateral margin in unexpanded bulb. Tibial apophysis more strongly developed than in other Californian species.

TYPE: Holotype, male, Guatay, San Diego County, California, July 9, 1953, W. J. and J. W. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 20).

SEASONAL DATA: Two males have been collected in June.

REMARKS: The body proportions and male palpus of *californicus* are similar to those of *gertschi* Chamberlin and Ivie, 1942, from Utah. In *gertschi* the palpus and bulb are more robust, two strong ventral cymbial spiniforms are present distad of the bulb, and the VBA covers the base of the embolus. In *californicus* only one of the cymbial spiniforms is ventral, and the VBA is weakly developed so that the base of the embolus is exposed from below.

Tibellus oblongus (Walckenaer)

Aranea oblonga WALCKENAER, 1802, vol. 2, p. 228.

Tibellus oblongus: SIMON, 1875, p. 311. GERTSCH, 1933a, p. 3.

FEMALE: Average length 8.0–8.5 mm.

¹ The female of *californicus* is unknown.



MAP 20. Distributions of *Tibellus californicus*, new species, and *T. oblongus* (Walckenaer).

PME interdistance index 1.2; posterior eye recurvature index 2.0–2.5; carapace 1.2–1.3 times as long as broad. Femur II length index 1.3–1.5; tibia I, 3–2–1. Abdomen not so elongate as that of typical *chamberlini* and *rothi*.

Epigynum (fig. 134): Lateral atria present, shallow and oval; guide pocket a transverse and posterior structure, hood obscuring intermittent orifice; epigynal suture shorter than that of *chamberlini* or *rothi*.

Receptaculum (fig. 133): Bursa copulatrix longer than that of *chamberlini* or *rothi*.

MALE: Average length 6.5–7.0 mm.

Carapace dimensions similar to those of female. Femur II length ratio 1.4–1.8.

Palpus (fig. 137): Teguloembolar unit elongate, not ridged basally, apically with a series of spiral ridges; subtegulum more broadly produced from beneath tegulum than that of *californicus*, but less narrowly than that of *chamberlini* or *rothi*, visible in unexpanded bulb at proximal margin of tegulum. Tibial apophysis short but more strongly developed than that of *chamberlini* or *rothi*.

DISTRIBUTION: "Throughout Europe and Asia and distributed in North America from Alaska across to eastern Canada and south to Mexico, becoming scarcer in its southern limits" (Gertsch, 1933a). The distribution in California is shown in map 20.

ECOLOGY: *Oblongus* is principally a field inhabitant.

SEASONAL DATA: Adults have been collected from March through July, but reared forms may mature as early as January or February.

Tibellus chamberlini Gertsch

Tibellus chamberlini GERTSCH, 1933a, pp. 10–11, figs. 7–9, 14.

FEMALE: Average length about 11.0 mm.

PME interdistance index 1.3–1.5; posterior eye recurvature index 2.5–3.5; carapace 1.3–1.4 times as long as broad. Femur II length index 1.8–1.9; tibia I, 3–3–1.

Epigynum (fig. 132): Width 0.54–0.66 mm. Lateral atria not developed; guide pocket situated well lateral to intermittent orifice; epigynal suture longer than that of *oblongus*.

MALE: Average length 7.5–8.0 mm.

Carapace dimensions similar to those of female. Femur II length index 2.2–2.4.

Palpus (figs. 130, 131): Teguloembolar unit prominent, bulbous basally, embolar portion a curved process projecting from retrolateral apex, unit ridged along entire length, from a prolateral aspect more robust than that of *rothi*, bulbous at base and tapering distad; subtegulum more broadly produced from beneath tegulum than that of *californicus* or *oblongus*, visible ventrally at prolateral margin of tegulum in unexpanded bulb. Tibial apophyses rudimentary.

TYPES: Holotype, male, allotype, female, Zion National Park, Utah, July 4, 1932, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Western United States, most common in non-boreal areas. The distribution in California is indicated in map 21.

ECOLOGY: *Chamberlini* is principally a field inhabitant.

SEASONAL DATA: Adult males and females have been taken from March through August. Two females (separate collections), collected in January in the San Diegan District, possibly represent overwintering forms.

REMARKS: Three females taken in two localities in the Shasta Valley and Modocian districts differ from southern specimens in the more medially placed intermittent orifices. The epigynum thus resembles that of *Tibellus maritimus* Menge, not yet reported from California. However, the leg spiniformation of these individuals differs from that of the latter species.

Tibellus rothi, new species

FEMALE: Average length about 11.0 mm.

Eye and carapace proportions similar to those of *chamberlini*, but femur II leg length index more variable, ranging from 1.6–1.9 (the lower values occurring in specimens from "instability" areas, discussed below).

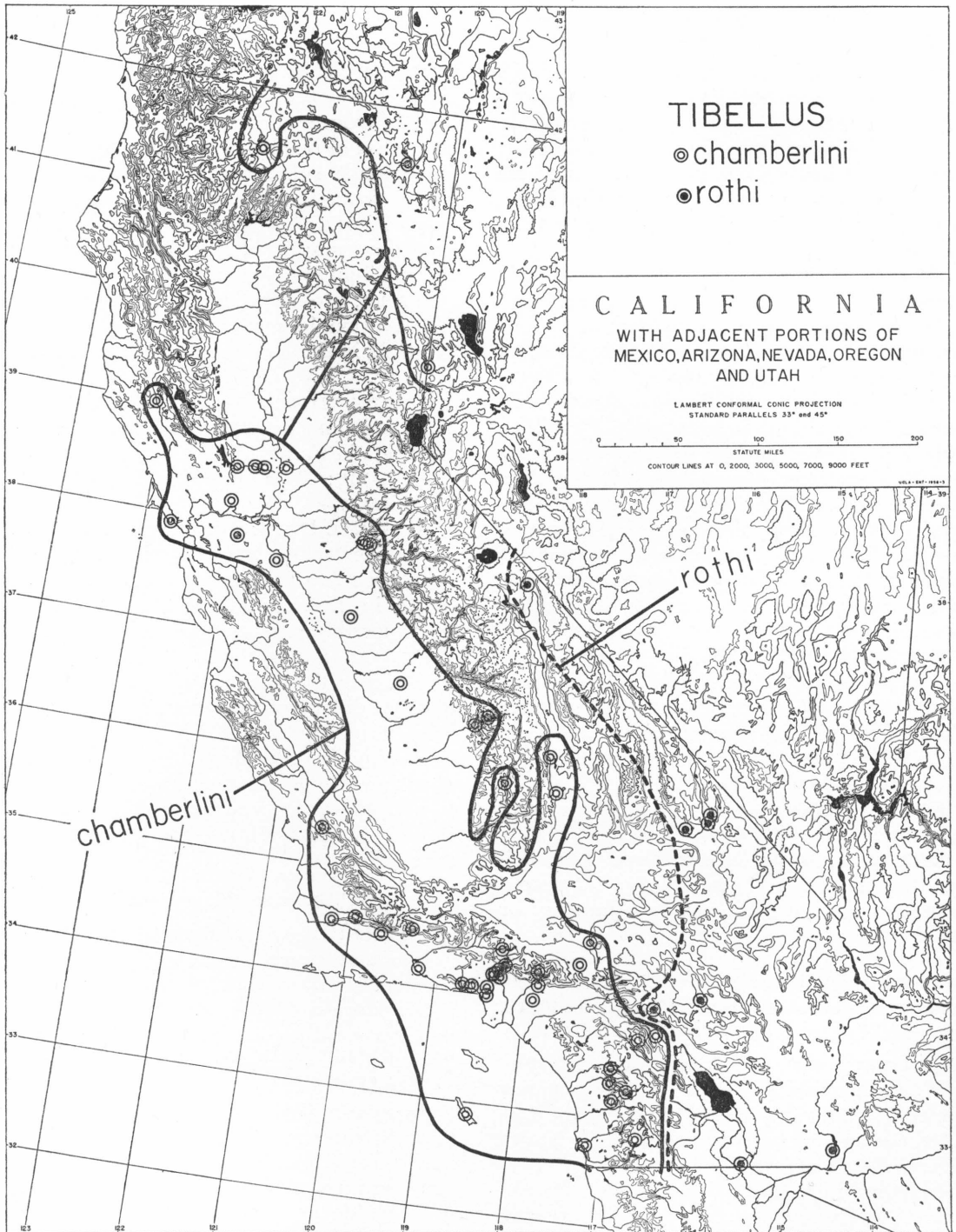
Tibia I, 3–3–1.

Epigynum (fig. 136): Width 0.39–0.45 mm., in some cases as wide as 0.48 mm. in specimens from instability areas. Lateral atria lacking; intermittent orifice situated next to or in guide pocket; epigynal suture longer than that of *oblongus*.

MALE: Average length 7.5–8.0 mm.

Femur II length index 2.2–2.4, in instability area specimens 1.9–2.2.

Palpus (fig. 135): Similar to that of *cham-*



MAP 21. Distributions of *Tibellus chamberlini* Gertsch and *T. rothi*, new species.

berlini, but teguloembolar unit more slender and cylindrical.

TYPE: Holotype, female, Imperial Dam, Imperial County, California, September 28, 1957, V. Roth, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 21); Arizona.

ECOLOGY: *Rothi* is principally a grass inhabitant.

SEASONAL DATA: Adult males have been collected from January through September; females, from April through September. One immature male taken in September matured in December.

REMARKS: The "instability" areas of the above descriptions, as represented by collecting sites, are southern Death Valley and Benton in Mono County. In these areas the femur II length index is more variable than elsewhere, ranging down to low values, and the epigynum is also variable, tending toward the *chamberlini* structure. It may be noted that these localities are at the periphery of the *rothi* geographic range and that *chamberlini* possibly ranges into these areas.

Chamberlini may have an instability area of its own, for at the southeastern edge of its range (Cathedral City, Riverside County) a male has been taken in which the teguloembolar unit deviates from that of the typical *chamberlini* form (otherwise a very stable character). Paralleling the case above, *rothi* occurs nearby (Morongo Valley, San Bernardino County).

SUBFAMILY THOMISINAE

Body without recumbent plumose or squamose setae. However, carapace setae in some cases recumbent when short and spatulate. Carapace setae C6, 7, 8 absent; P2 and S2 not characteristic elements; T3 a prominent primary; A5 directed mesiad. Legs I and II similar in length, disproportionately longer than legs II and IV, the latter two pairs also similar in length; tarsi lacking tenent and pectinate setae on plantar surface, but pectinate setae present at the tip of the distitarsus. Male palpus: Embolus composed of an outer truncus and an inner pars pendula; tegular segment of reservoir of receptaculum seminis peripheral, semilunar in configuration and relatively broader than that in the Philo-

drominae, tapering distad abruptly so that the boundary between the reservoir and ejaculatory duct is distinct. Conductor absent. Epigynum: Epigynal suture not developed, homologue an indistinct pit. Receptaculum: Spermathecal apodeme cylindrical, developed at posterior end of spermatheca.

GENUS DIAEA THORELL

Diana SIMON, 1864, p. 432 (preoccupied by *Diana* Risso, 1826).

Diaea THORELL, 1869, p. 37 (new name for *Diana* Simon). GERTSCH, 1929, p. 332.

TYPE: *Aranea dorsata* Fabricius, 1777.

Clypeus vertical, not carinate; lateral eye tubercles discrete; ALE larger than AME. Carapace setae setiform; seta A1 distinctly shorter than A2, both well developed and erect; X-seta apparently lacking; T5 a principal element of the discal vestiture. Femora with prodorsal spiniforms; tibiae I and II with a prolateral but typically without a proventroapical spiniform; basitarsi I and II with three prolateral, three to five pairs of proventral, and two proapical, spiniforms; legs I and II of male with well-developed spiniforms. Male palpus: Embolus of generalized type; tegulum lacking apophyses; circumtegular ridge present, basal tegular ridge absent. Tutacular apophysis not apparent. ITA situated on apex of RTA. Receptaculum: Bursa copulatrix and spermatheca not sharply delimited from each other; tuberculate spermathecal organ not present.

This description is based on *Diaea pictilis* (Banks).

Diaea pictilis (Banks)

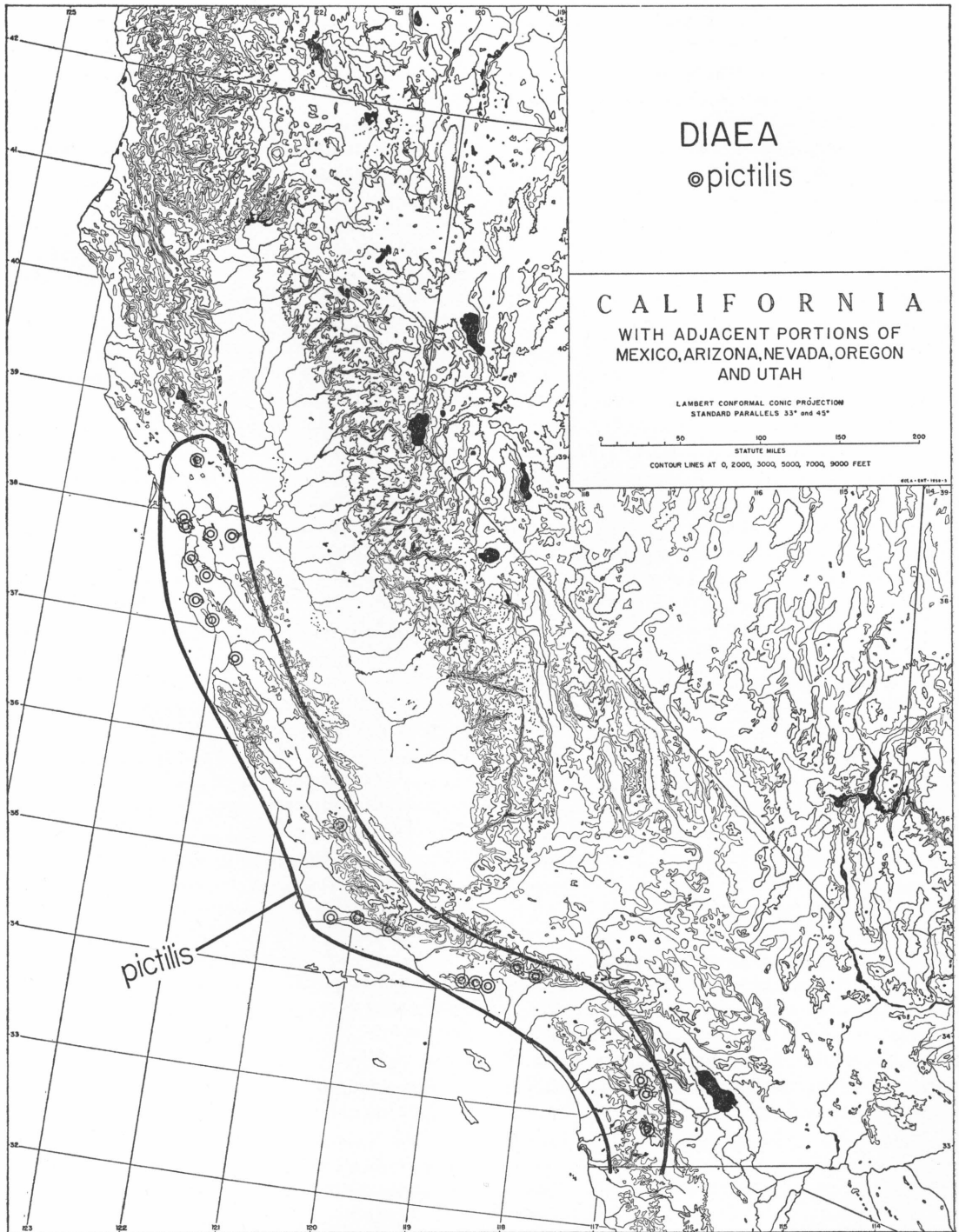
Misumena pictilis BANKS, 1896, p. 91.

Misumessus muniere COOLIDGE, 1909, p. 243. New synonymy.

Diaea pictilis: GERTSCH, 1939, p. 332.

FEMALE: Average length about 6.5 mm.

Carapace bright green, with red spot at base of setae S1 and T1; eye tubercles pale yellow. Legs largely concolorous with carapace but pale amber distally. Abdomen with an extensive dorsal red area sharply delimited from the remainder of the abdomen by a broad darker rim, interior portion with white maculae, a dark red spot at base of setae, and occasionally a jet black cardiac mark; sides of abdomen bright yellow. In al-

MAP 22. Distribution of *Diaea pictilis* (Banks).

cohol the greens of the carapace and legs fade to a dull light brown, and only the spots at the base of the setae may persist as prominent markings on the dorsum of the abdomen.

Epigynum (fig. 145): Structure obscure owing to weak sclerotization. Hood well developed but atrium lacking; intromittent orifice situated lateral to hood.

Receptaculum (fig. 146): Entire structure weakly sclerotized.

MALE: Average length 4.0–4.5 mm.

Lateral margin of carapace with a red rim, otherwise carapace like that of female. Femora pale green, other segments pale amber and with a distal red annulus which fades in alcohol. Dorsum of abdomen similar to that of female, but dorsal red marking darker, distinct marginal rim lacking, and with larger spots at base of setae; sides of abdomen creamy white; ventral stripe lacking.

Palpus (fig. 144): Embolus originating near 90 degrees and encircling tegulum for one complete turn, terminating as a dorsally recurved hook; pars pendula nearly as long as truncus. Distal tooth of RTA bifurcate.

TYPES: Holotype, female*, of *pictilis* from Palo Alto, California, W. Doane, in the Museum of Comparative Zoölogy. Holotype, female*, of *munieri* from Muir Woods, Marin County, in collection of Stanford University.

DISTRIBUTION: Known from California only (map 22).

ECOLOGY: In the Californian Province *pictilis* has been collected only on the coast live oak, *Quercus agrifolia* Neé, and principally in Coastal Oak Woodland.

SEASONAL DATA: Mature individuals have been collected from December through June, the majority during March and April.

REMARKS: This is the most beautiful crab spider in California, but unfortunately, as indicated in the description, the striking coloration fades in alcohol.

GENUS *MISUMENOIDES* F. PICKARD-CAMBRIDGE

Misumenoides F. PICKARD-CAMBRIDGE, 1900, p. 136. GERTSCH, 1939, p. 309.

TYPE: *Runcinia magna* Keyserling, 1880.

Clypeus vertical, with a white anterior carina curving caudad onto allatum; lateral eyes situated on a common and strongly projecting process; ALE and AME subequal in

size. Carapace setae setiform, greatly reduced in size; setae A1 and A2 greatly reduced, recumbent, and subequal in length; X-seta lacking; T5, as well as most other primary carapace setae, greatly reduced. Prodorsal spiniforms of femora not developed; tibiae I and II without prolateral spiniforms and without a proventroapical spiniform; basitarsi I and II with no prolateral spiniforms, six or more proventral spiniforms and one proapical spiniform; legs I and II of male with well-developed spiniforms. Male palpus: Tegulum without apophyses; apical embolar sclerite developed; basal tegular ridge absent, circumtegular ridge present. Tutacular apophysis weakly developed. ITA reduced, situated on ventral margin of RTA at about midpoint of latter. Receptaculum: Bursa copulatrix and spermatheca distinctly delimited; spermathecal organ apparent as a small tubercle on lateral margin of receptaculum.

This description is based on *Misumenoides formosipes* (Walckenaer).

Misumenoides formosipes (Walckenaer)

Thomisus formosipes WALCKENAER, 1837, p. 504.

Thomisus aleatorius HENTZ, 1847, p. 444, pl. 23, fig. 2. Synonymy by Chamberlin and Ivie (1944).

Misumenoides aleatorius: PETRUNKEVITCH, 1911, p. 408. GERTSCH, 1939, p. 313.

Misumenoides formosipes: CHAMBERLIN AND IVIE, 1944, p. 159.

FEMALE: Average length 8.0 mm.

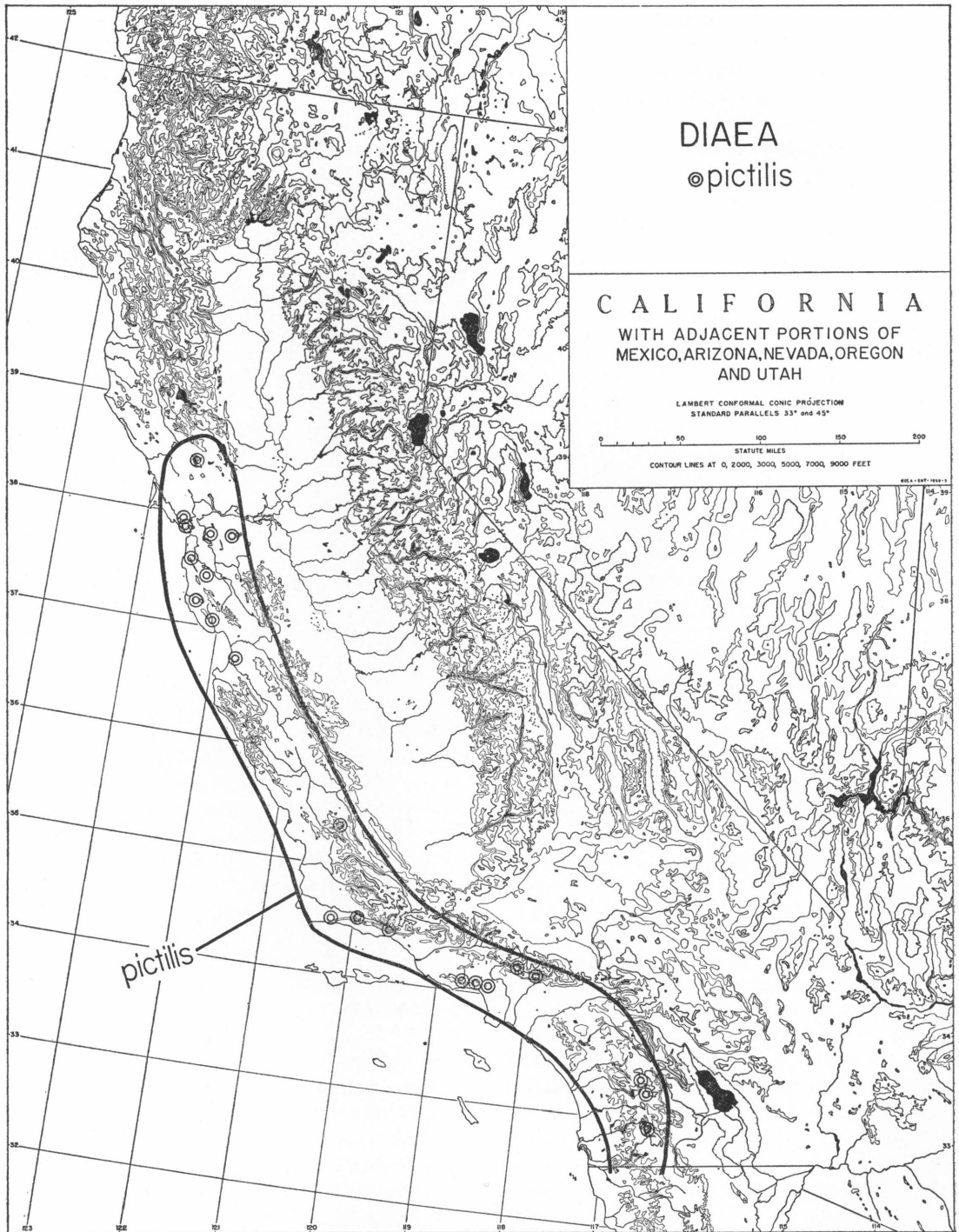
Ocular area with narrow, dark brown band passing through posterior row of eyes; allatal stripe brown, distinct, about one-half of width of allatum; only carapace setae C3 and S1 spiniform, in some cases not even these; mesodiscals and metadiscals and caudoallatals not distinct. Legs pale, telotarsi I and II and parts of other segments dark. Abdomen white to yellow, with distinct to weakly developed dorsal and lateral markings; sides often with heavy oblique striations; ventral stripe present, usually in form of broad band.

Epigynum (fig. 148): Anterior guide pocket present; atrium medial; intromittent orifice obscure, in atrium at base of guide pocket.

Receptaculum as shown in figure 149.

MALE: Average length about 3.5 mm.

Allatum uniformly light brown; mesodiscals and metadiscals and caudoallatal setae

MAP 22. Distribution of *Diaea pictilis* (Banks).

not spiniform. Legs uniformly dark brown. Abdomen pale and unmarked above, with a dark lateral area and a wide ventral band similar to those of female.

Palpus (fig. 147): Embolus originating near 270 degrees on tegulum; apical embolar sclerite a slightly curved spine; circumtegular ridge retrolaterally produced as a broad, thin apophysis.

TYPES: Holotype, female, of *formosipes* (based on John Abbott drawing number 416) from Georgia (Chamberlin and Ivie, 1944). Holotype, male, of *aleatorius* from Alabama, September (type lost; Gertsch, 1939).

DISTRIBUTION: Gertsch (1939) states: "This fine species is a characteristic element of the Misumenid fauna in Canada and the states east of the Rockies. It is also found on the Pacific Coast but no records are available from such Great Basin states as Utah, Idaho and Nevada." The distribution in California is shown in map 23.

ECOLOGY: In the San Diegan District, at least, *formosipes* has been taken only in urban areas.

SEASONAL DATA: Mature males have been taken from July through September and mature females from August through March; the preponderance of females, in October.

GENUS MISUMENA LATREILLE

Misumena LATREILLE, 1804, p. 135. SIMON, 1895, p. 1025; 1903, p. 1012. F. PICKARD-CAMBRIDGE, 1900, p. 141. GERTSCH, 1939, p. 314.

TYPE: *Araneus vatus* Clerck, 1758.

Clypeus vertical, lacking a carina; lateral eyes situated on a common and strongly projecting process; ALE and AME subequal in size. Carapace setae setiform, greatly reduced in size; setae A1 and A2 either reduced and subequal in length or A2 much longer than A1; X-seta lacking; only T5 of mesodiscal and metadiscal primary setae distinct. Prodorsal spiniforms of femora small; tibiae I and II without prolateral spiniforms and without a proventroapical spiniform; basitarsi I and II with no prolateral spiniforms, six or more proventral spiniforms, and one proapical spiniform; legs I and II of males with weakly developed spiniforms. Male palpus: Tegulum without apophyses; apical embolar sclerite developed; basal tegular ridge

absent, circumtegular ridge present. Tutacular apophysis weakly developed. ITA well developed, situated at proventral base of RTA. Receptaculum: Bursa copulatrix distinctly delimited from spermatheca; spermathecal organ not apparent as a tuberculate structure.

This description is based on *Misumena vatia* (Clerck).

Misumena vatia (Clerck)

Araneus vatus CLERCK, 1758, p. 128, pl. 6, fig. 5.

Aranea calycina LINNAEUS, 1758, p. 620.

Synonymy with *vatia* by Thorell, 1856.

Misumena vatia: THORELL, 1870, p. 182.

Misumena modesta BANKS, 1898, p. 262, pl. 16, fig. 1. Synonymy with *calycina* by Gertsch, 1939.

Misumena calycina: GERTSCH, 1939, p. 314.

FEMALE: Average length about 8.0 mm., range about 6–10 mm.

Allatal stripe about one-half of width of allatum, or stripe not developed. Legs pale, unmarked. Abdomen white to yellow, unmarked or with red anteriolateral areas.

Epigynum (fig. 151): Anterior guide pocket present; median septum and atrium lacking; intromittent orifice situated beneath concavity lateral to guide pocket.

Receptaculum (fig. 150): Spermatheca covered by numerous small flat tubercles.

MALE: Average length about 4.0 mm.

Allatum dark brown. Anterior legs dark reddish brown, with pale annuli. Dorsum of abdomen pale, with red to brown paramedial bands broken transversely into maculae; lateral stripe and ventral stripe present.

Palpus (fig. 152): Embolus originating near 315 degrees, embolar sclerite spiralliform, ridged.

TYPES: Type of *vatia* from Sweden. Lectotype, male, of *modesta** from Mexico (new lectotype designation), in the Museum of Comparative Zoölogy. The syntype female in the vial with the lectotype is *Misumenops deserti*, new species.

DISTRIBUTION: Holarctic (Gertsch, 1939). The distribution in California is shown in map 23.

SEASONAL DATA: Mature males have been taken from April through July; mature females, from June through September (the only female collected in September showed signs of senility).

GENUS *MISUMENOPS* F. PICKARD-CAMBRIDGE

Misumenops F. PICKARD-CAMBRIDGE, 1900, p. 141, GERTSCH, 1939, p. 318.

Minumessus BANKS, 1940b, p. 112. Synonymy with *Misumenops* by Petrunkevitch, 1911.

TYPES: Of *Misumenops*, *Misumena maculisparsa* Keyserling, 1880. Of *Misumessus*, *Misumena oblonga* Keyserling, 1891.

Clypeus vertical, acarinate; lateral eyes situated on a common and strongly projecting process; ALE larger than PME. Carapace setae setiform; setae A1 and A2 well developed and erect, A2 much longer than A1; X-seta lacking; T5 usually a principal element of discal vestiture. Prodorsal spiniforms of femora well developed; tibiae I and II usually without prolateral spiniforms and without a proventroapical spiniform; basitarsi I and II with no prolateral spiniforms, six or more proventral spiniforms and one proapical spiniform; legs I and II of males with weakly developed spiniforms. Male palpus: Tegulum without apophyses; embolus of generalized type or, more usually, articulating type; basal tegular ridge absent, circumtegular ridge present. Tutacular apophysis weakly developed. ITA well developed, situated subapically on ventral side of RTA. Receptaculum: Bursa copulatrix and spermatheca distinctly delimited; spermathecal organ apparent as a prominent tubercle situated on lateral or, more usually, anterior margin of spermatheca.

A characteristic of *Misumenops*, not mentioned above, is the presence on the RTA of a distal membranous area from which a fine hair arises. The homologue of this structure in *Misumenoides* and *Misumena* is apparently a ventroapical lobe on the RTA.

Two subgenera can be recognized in the United States, *Misumenops* and *Misumessus*. These subgenera are distinguished decisively on the basis of genitalia. [However, the Neotropical *M. (Misumenops) maculisparsa* Keyserling in many ways is intermediate.] In *Misumessus* the epigynum essentially comprises a tonguelike structure, the intromittent division of the receptaculum is an undivided tube, and the male palpus is of a generalized type. In *Misumenops* the epigynum shows a hood and median septum, the intromittent division is divided longitudinally, and the male palpus is of an articulating type.

Also, in those specimens of *Misumessus* that were examined, many of the primary carapace setae are greatly reduced, whereas in *Misumenops* these setae are usually well developed.

The genus *Misumessus*, as proposed by Banks, was quite a heterogeneous group, including *Misumenops (Misumessus) oblongus* Keyserling, various species placed in the subgenus *Misumenops* here, *Diaea pictilis* (Banks), and *Parasynema viridans* (Banks). The name is used here in a much more restricted sense to include the apparently more generalized species of our *Misumenops*.

KEY TO THE SPECIES OF *Misumenops*
IN CALIFORNIA

Males

1. Dorsum of abdomen unmarked. Embolus without a terminal spiral (fig. 153; subgenus *Misumessus*) *oblongus*
Dorsum of abdomen with paramedial maculae or paramedial stripes. Embolus terminating in a spiral (subgenus *Misumenops*) 2
- 2(1). Embolus terminating in a double spiral (*coloradensis* group) *coloradensis*
Embolus terminating in a single spiral 3
- 3(2). Truncus stout, prominently ridged; cymbium deeply emarginate on retrolateral side (figs. 188, 191; *asperatus* group) 4
Truncus slender, not obviously ridged; cymbium not or only slightly emarginate on retrolateral side (*celer* group) 5
- 4(3). Embolus acuminate, terminating in a flat spiral of about 180 degrees (fig. 188) *verityi*
Embolus apically truncate, terminating in a tightly wound helix (fig. 191) *devius*
- 5(3). Embolus originating near 315 degrees, short, apical division (not including terminal spiral) less than half of width of tegulum (fig. 158) *dubius*
Embolus originating near 270 degrees or farther basally, apical division (not including terminal spiral) longer than half of width of tegulum 6
- 6(5). Embolus originating near 270 degrees, apical division distinctly arched near its base, and in its intermediate portion nearly straight and oriented at a tangent to anterior margin of tegulum (as in fig. 160; *rothi* complex) 7

- Embolus originating farther basally than 270 degrees (range indicated by figs. 171 and 179), basal and intermediate portions of apical division evenly curved around edge of tegulum (as in fig. 171; *celer* complex) 11
- 7(6). Dorsum of abdomen with a pair of prominent dorsal longitudinal, and three prominent lateral oblique, stripes, the latter usually joined to longitudinal stripes *schlingeri*
Dorsum of abdomen without such heavy stripes 8
- 8(7). Allatal stripe markedly broader than one-half of width of allatum. Abdomen with pigmented spot at base of setae. Californian Province and Great Valley District, primarily on deciduous oak *quercinus*
Allatal stripe at most only slightly broader than one-half of width of allatum 9
- 9(8). Pigmented band of basitarsus I at least two-thirds of length of segment. Carapace seta T1 usually much shorter and more slender than S1; S3 and T5 usually shorter than PME interdistance. Sierran, Modocian, Monoan districts *sierrensis*
Pigmented band of basitarsus I narrower than two-thirds of length of segment, usually only about one-half of length. Carapace seta S1 shorter than T1 and about as stout; S3 and T5 longer than PME interdistance 11
- 10(9). Apical division of embolus typically arched at base at angle markedly greater than 90 degrees (fig. 160). Anterior femora usually without pigmented spots aside from those at base of spiniforms. Length of tegulum 0.25–0.30 mm.; diameter of embolar spiral about 0.06 mm *rothi*
Apical division of embolus more sharply arched, at angle close to 90 degrees (fig. 166). Anterior femora with numerous pigmented patches usually densely distributed on prolateral surface and forming a heavy stripe. Length of tegulum 0.42–0.44 mm.; diameter of embolar spiral 0.12–0.17 mm. *gabrielensis*
- 11(6). Embolus originating from 180 to 225 degrees (figs. 171, 174) 12
Embolus originating farther basally 14
- 12(11). Abdominal paramedial maculae confluent longitudinally *lepidus*
- Abdominal paramedial maculae discrete or absent 13
- 13(12). Embolus originating from near level of prolateral margin of tibia (fig. 174) to about 180 degrees. Length of tegulum 0.36–0.42 mm.; diameter of embolar spiral 0.18–0.21 mm. See map 28 for distribution . . *importunus importunus*
Embolus originating near level of prolateral margin of tibia, similar to what is shown in figure 171. Length of tegulum 0.30–0.35 mm.; diameter of embolar spiral 0.09–0.10 mm. Yuman District *celer*
- 14(11). Distal tooth of RTA without a discrete, more slender, apical portion (fig. 177); truncus (as seen prolaterally) typically broad, not abruptly tapered apicad (fig. 176) 15
Distal tooth of RTA with a discrete, more slender, apical portion (fig. 180); truncus (as seen prolaterally) narrower and more markedly tapered apicad (fig. 178) 17
- 15(14). Mesodiscus brown, not glossy. Ventral abdominal stripe present. Southern Saltonian District . . *deserti*, in part
Mesodiscus pale, glossy. Ventral abdominal stripe present or absent 16
- 16(15). Paramedial abdominal maculae typically confluent longitudinally; ventral abdominal stripe usually present. Californian Province (map 27) *californicus*
Paramedial abdominal maculae, when developed, discrete; ventral abdominal stripe not present. Sonoran Province, Great Valley District (map 27) *deserti*, in part
- 17(14). Entire allatum dark brown; sternum brown *aikooae*
Allatum with only a light brown mesial stripe; sternum pale *importunus belkini*

Females

1. Epigynum a tongue-shaped flap (fig. 154; subgenus *Misumessus*) . . . *oblongus*
Epigynum not as above (subgenus *Misumenops*) 2
- 2(1). Median septum with arch (as in figs. 173, 183) or with contiguous oval to round intromittent orifices (as in figs. 162, 172) (*celer* group) 3
Median septum not as above (figs. 189, 192, 195) 14
- 3(2). Median septum narrow and long, usually extending to level of posterior margin of

- hood or farther anterior (to beneath hood), and intromittent orifice distinct as a large oval orifice (may be obscured when occluded with exudate; figs. 169, 172, 173) 4
- Median septum usually broader and shorter, not reaching level of posterior margin of hood; intromittent orifice not developed as a large distinct opening, except in *schlingeri* (figs. 159, 162, 183, 185) 7
- 4(3). Intromittent orifice elliptical, longer than broad and not situated beneath hood (fig. 173), or broader than long and entire anterior margin hidden by hood (fig. 172) 5
- Intromittent orifice not as above; hood usually more convex, as shown in figure 169 9
- 5(4). Carapace seta T5 present. Californian Province (map 27) *californicus*
- Carapace seta T4 absent. Sonoran Province, Great Valley District (map 27) *deserti*
- 6(4). Allatal stripe brown; seta T4 absent. Yuman District *celer*
- Allatal stripe grayish; seta T4 present. Distributed throughout most of California but not beyond western margins of Sonoran Province *lepidus*
- 7(3). Dorsum of abdomen typically with a pair of conspicuous longitudinal stripes and three lateral oblique stripes, the latter usually joined to longitudinal stripes *schlingeri*
- Dorsum of abdomen without such markings 8
- 8(7). Median septum of epigynum broad, and intromittent orifice usually developed as a distinct although small orifice (figs. 159, 162). Membranous bursa copulatrix short, not visible dorsally (figs. 157, 163), straight to slightly curved (requires dissection) 9
- Median septum of epigynum typically narrower; intromittent orifice not developed as a distinct aperture (as in fig. 183). Membranous bursa copulatrix long, visible dorsally, with a marked convolution (requires dissection; as in fig. 187, mbc) 13
- 9(8). Arch of median septum not developed, median septum very short, in some cases so short as not to be apparent, intromittent orifice contiguous with septum (fig. 159). Sclerotized bursa copulatrix not convoluted (fig. 157) *dubius*
- Arch of median septum present, median septum longer, in all cases distinct, intromittent orifice not contiguous with septum (fig. 162). Sclerotized bursa copulatrix convoluted (as in fig. 163) 10
- 10(9). Dorsal carapace setae typically reduced in length, most or all (excepting A2) usually markedly shorter than PME interdistance. Sierran, Modocian, Monoan districts *sierrensis*
- Most primary carapace setae at least as long as PME interdistance 11
- 11(10). Dorsum of abdomen without pigmented spot at base of setae *rothi*
- Dorsum of abdomen with an orange spot at base of setae 12
- 12(11). Allatum typically distinctly, and usually entirely, marked with red or grayish pigmented areas. Paramedial maculae bar-shaped, obliquely oriented *quercinus*
- Allatum with a more or less distinct mesial stripe or unmarked. Paramedial maculae, when present, oval in outline *gabrielensis*
- 13(7). Entire allatum dark brown; primary carapace setae shorter than PME interdistance; dorsum of abdomen with well-developed paramedial maculae *aikooae*
- Entire allatum pale brown or more usually with a narrow stripe; primary carapace setae at least as long as PME interdistance; dorsum of abdomen without paramedial maculae *importunus importunus; i. belkini*
- 14(12). Epigynum without a depression (fig. 195) *coloradensis*
- Epigynum with a median depression containing septum and orifices 15
- 15(14). Posterior rim of hood typically concave; median septum flat. Receptaculum as shown in figure 190 *verityi*
- Posterior rim of hood typically convex; median septum bulbous. Receptaculum as shown in figure 193 *devius*

SUBGENUS MISUMESSUS BANKS

TYPE: *Misumena oblonga* Keyserling, 1880.

Primary carapace setae very short, all markedly shorter than PME interdistance. Male palpus: Embolus of generalized type, terminal portion straight, situated in a narrow, elongate tutaculum along retrolateral edge of cymbium. Epigynum: Median septum and bilateral atria not present. Recepta-

culum: Bursa copulatrix with a proximal and distal subdivision, but the latter not subdivided longitudinally.

This description is based principally on *Misumenops oblongus*.

**Misumenops (Misumessus)
oblongus** (Keyserling)

Misumena oblonga KEYSERLING, 1880, pp. 79-80, pl. 2, fig. 41.

Misumessus oblongus: BANKS, 1904b, p. 112.

Misumenops oblongus: PERUNKEVITCH, 1911, p. 413. GERTSCH, 1939, p. 319.

FEMALE: Average length about 5.5 mm.

Carapace entirely pale green, fading to pale brown in alcohol. Legs concolorous with carapace. Dorsum of abdomen silvery white or pale green, unmarked.

Epigynum (fig. 154): Guide pocket not present; instead, large tongue-like flap developed in anterior portion of epigynum; intromittent orifice obscure, situated at base of flap.

Receptaculum (fig. 155): Bursa copulatrix tubular, with a narrower proximal segment looping around a more robust and convoluted distal portion; spermatheca lenticular, spermathecal organ situated at lateral apex.

MALE: Average length about 3.0 mm.

Carapace orange-red, allatum slightly darker, with a bright red marginal line. Femora I, II bright green, fading to pale brown in alcohol, with dark red ventral stripe; other segments of legs I, II with broad red distal annulus, but tibia may be entirely red (reds persist longer than greens in alcohol). Dorsum of abdomen light green and unmarked, except for anteriolateral white margin.

Palpus (fig. 153): Embolus originating between 0 and 90 degrees, encircling bulb for one complete turn in essentially circular orbit, terminating as narrow straight spine. Distal tooth of RTA stout, hook-shaped, directed dorsad.

TYPES: Syntypes, male, from Baltimore and Peoria, Illinois, in Koch collection, British Museum (Natural History).

DISTRIBUTION: "United States in general, more rare in northern part. Mexico" (Gertsch, 1939). The distribution in California is shown in map 24.

SEASONAL DATA: Mature individuals have

been taken from June through August, most commonly in June and July. Immature males and females in two separate April collections have molted to maturity in the laboratory as early as May.

SUBGENUS MISUMENOPS F. PICKARD-CAMBRIDGE

TYPE: *Misumena maculisparsa* Keyserling, 1891.

Primary carapace setae typically elongate. Male palpus: Embolus of articulating type, with a terminal spiral; tutaculum a shallow, round depression on retrolateral face of cymbium. Epigynum: Median septum and bilateral atria typically present. Receptaculum: Intromittent division comprising a proximal membranous bursa copulatrix and distal subdivision, further subdivided longitudinally into a sclerotized bursa copulatrix and a ventral canal.

The morphology of the male palpus and receptaculum (see fig. 187) is briefly discussed in the Morphology section.

The subgenus *Misumenops* in the Nearctic Region can be divided into three groups: *celer*, *asperatus*, and *coloradensis*.

Celer Group

Male palpus: Basal division of embolus without a dorsal spine; embolus terminating in single spiral; truncus slender, inconspicuously twisted near base. Cymbium only slightly emarginate on retrolateral side. Distal tooth of RTA apical. Receptaculum: Not rotated from position typical of genus.

The *Misumenops celer* group forms a major part of the thomisid fauna of California, as evidenced by the wealth of species and abundance in numbers of individuals. Taxonomically, it is the most difficult group. The species are very closely related and may show a range of variation that is suggestive of the occurrence of hybridization. In many cases interbreeding will occur in laboratory crosses. The treatment of the species of the group, more than that of any of the others discussed in the present paper, must be considered as preliminary. Three species complexes can be recognized in the *celer* group: *dubius*, *rothi*, and *celer*.

The *dubius* complex in the Nearctic Region comprises *M. dubius* Keyserling and *M. prosper* O. Pickard-Cambridge. The embolus is



MAP 24. Distributions of *Misumenops oblongus* (Keyserling) and *M. dubius* (Keyserling).

the shortest of the *celer* group and originates near 315 degrees (fig. 158). The membranous bursa copulatrix is the shortest of the group and not conspicuous dorsally; the sclerotized bursa copulatrix is not convoluted (fig. 157).

The *rothi* complex comprises five new species, all known only from California: *rothi*, *gabrielensis*, *sierrensis*, *quercinus*, and *schlingeri*. The embolus is intermediate in length between that of the *dubius* and that of the *celer* complexes, originates near 270 degrees, and the distal division is characteristically arched near the base (as in fig. 160). The membranous bursa copulatrix is intermediate in length between that of the *dubius* and that of the *celer* complexes, without a convolution and not conspicuous dorsally; the sclerotized bursa copulatrix is convoluted (as in fig. 165).

The *celer* complex in the Nearctic region comprises *M. celer* (Hentz), *M. lepidus* (Thorell), *M. deserti*, new species, *M. californicus* (Banks), *M. importunus importunus* (Keyserling), *M. i. belkini*, new subspecies, and *M. aikoeae*, new species. The embolus is the longest of the group (fig. 171 shows the shortest of the complex), originates from 135 to 225 degrees, and the distal division is evenly curved around the margin of the tegulum. The membranous bursa copulatrix typically is the longest of the group, is visible dorsally, and has a distinct convolution; the sclerotized bursa copulatrix is convoluted (as in fig. 187).

Some field and experimental crossbreeding data, reflecting isolating mechanisms between some of the species of the *celer* group, are given below. The field data indicate ecological and seasonal mechanisms and also whether hybridization may be occurring. The crossbreeding data indicate behavioral, mechanical, or genetic (i.e., postmating) mechanisms. Control crosses have been made in relation to all the interspecific crosses mentioned below, except in *deserti*. In the control crosses, under normal circumstances (when the individuals are not too old and if the male has not been unduly disturbed), the male was always attracted to the female and had no difficulty in orienting its palpi. However, in some cases no eggs, or inviable eggs, were laid. Most progeny reared reasonably well, with the technique described in the Materials and Methods section (with the exception of *Misumenops*

rothi in which there is a high mortality rate in the first instar), but there appeared to be a decrease in the viability of the adults in some of the species. The occasionally negative results regarding egg laying and the inviability of the spiderlings in some of the control crosses must be kept in mind when one is evaluating the statistically too few individual experimental crosses that are described below.

***Rothi-quercinus* RELATIONSHIPS:** These two species can be separated with reliability by markings. *Rothi* and *quercinus* are partly sympatric. *Quercinus* has been taken primarily in oak woodland and, where *quercinus* is sympatric with *rothi*, principally on oak (*rothi* on other vegetation). Intermediate specimens are not known. In reciprocal, laboratory, sympatric, *rothi-quercinus* crosses the males were not attracted to the female of the other species. In contrast, an allopatric *rothi* male $\times$ *quercinus* female cross resulted in normal copulation, and viable F₁ eggs were obtained. The F₁ spiderlings in general attained the third or fourth instar but then ceased development, although one female developed to the adult stage. This cessation, however, may be due to diapause rather than to genetic inviability.

It would thus seem that sympatric *rothi* and *quercinus* are reproductively isolated by at least ecological and ethological mechanisms.

***Rothi-sierrensis* RELATIONSHIPS:** The distinctness of these largely allopatric forms is indicated by (1) the non-intermediacy in specimens taken in an overlapping area (Monoan District) and (2) the death by the third instar of all six of the most healthy F₁ obtained in a laboratory cross (the others were discarded).

***Rothi-gabrielensis* RELATIONSHIPS:** *Misumenops* (*Misumenops*) *rothi* and *gabrielensis* apparently are largely allopatric, *rothi* occurring widely in southwestern California, in general below chaparral communities, while *gabrielensis* is found primarily in understory broad-leaved vegetation in riparian areas surrounded by chaparral.

Gabrielensis male $\times$ *rothi* female crosses were attempted, but the male was unable to orient the palpus to effect coitus, apparently owing to the larger palpus of that species.

Based on a similar situation in *lepidus* and *californicus*, the reciprocal cross might result in successful copulation.

Sierrensis-gabrielensis RELATIONSHIPS: These two species are allopatric, *sierrensis* occurring primarily in boreal areas of northern California and *gabrielensis* primarily in austral areas of southern California. The genitalia are similar, and taxonomic discrimination is best made on carapace chaetotaxy. A *gabrielensis* male $\times$ *sierrensis* female cross produced a vigorous F_1 , and adults were obtained within six months. However, because of the ecological non-complementarity and the morphological differences comparable to those between the other species of the complex, these two forms are treated as full species.

Celer-deserti RELATIONSHIPS: These two species are sympatric in the Yuman District (and eastward into Arizona and the state of Sonora, Mexico). Many of the females (but not males) of *deserti* taken in the Yuman District show a type of variability in facies and genitalia in which the condition in *celer* is approached, but *celer* from California is not pronouncedly variable (however, only three females are known from the state). Experimental crossbreedings between these species have not been carried out. It seems unlikely that the *deserti* male could copulate with the female *celer*, owing to the large size of the *deserti* palpus, but the reciprocal cross might be possible.

Lepidus-californicus RELATIONSHIPS: *Misumenops* (*Misumenops*) *californicus* throughout its range in southwestern and central-western California is sympatric with the more widespread *lepidus*.

In laboratory experiments a *lepidus* male copulated with a *californicus* female, and sterile eggs were produced. In a *californicus* male $\times$ *lepidus* female cross, copulation was attempted but was unsuccessful, owing to the inability of the male to orient the palpus of this species. However, some southern Californian females show intermediate types of genitalia and cannot be determined with certainty as *lepidus* or *californicus*. (The facies of both species is quite similar and, at the present time, cannot serve as a taxonomic tool.) The intermediate forms may occur in the same collection with typical

forms of both species. In Willits (Mendocino County), apparently just outside the range of *californicus*, one male out of a series of otherwise normal *lepidus* approached *californicus* in the palpus, which suggests that the convergence is the result of species variation.

Deserti-californicus RELATIONSHIPS: These two species overlap geographically to only a slight extent and are distinguishable, in general, only on the basis of markings and chaetotaxy, for the genitalia are virtually identical. In two attempted *deserti* male $\times$ *californicus* female crosses, the male was not attracted or, when mating did occur, copulation was not successful (as indicated by the failure of the female to lay eggs). In one reciprocal cross a *californicus* male successfully inseminated a *deserti* female, but the eggs were sterile.

Deserti and *californicus* thus appear to be reproductively isolated and may not be so closely related as their genitalic structure would indicate.

Deserti-belkini RELATIONSHIPS: These two species are partly sympatric, and hybridization might be occurring in the overlapping area.

Discrimination between *belkini* and *deserti* females in the upper Coachella Valley, Mojave Desert, and Owens Valley is very difficult, for the characters of the two species seem to blend, but the few males taken in these areas do not appear to be intermediate. The only female collected in another area, Cuyama in the southwestern San Joaquin Valley (where *belkini* and *deserti* are probably sympatric), is structurally as good an intermediate hybrid as could be expected (see Deviate section under *belkini*).

In the only cross attempted, a *belkini* male was mated to a *deserti* female, the latter from outside the range of *belkini*. Copulation was normal, and a vigorous F_1 generation resulted of which three males matured in a relatively short time. The embolus of two of the hybrids was intermediate, but, surprisingly, the distal tooth of the RTA was of the *belkini* type. The third hybrid specimen had anomalous palpi of which both were identical.

Despite some of the above data it seems that hybridization does not usually occur in nature. A difference in the temporal distribution of the adult stages of *belkini* and *deserti* may partially account for reproductive isola-

tion. In the areas where both species occur, *deserti* adults have been taken mainly in the late spring and early summer and *belkini* adults mainly in the winter and early spring. In the Saltonian District, beyond the range of *belkini*, *deserti* adults also occur in late winter and early spring.

Californicus-belkini RELATIONSHIPS: These two forms show a convergence in diagnostic markings and genitalic characters. However, *californicus* and *belkini* appear to be reproductively isolated. In two of three *belkini* male $\times$ *californicus* female matings the male was not attracted to the female (in one the male was removed and immediately placed with a *belkini* female and copulation ensued normally). In the third *belkini* male $\times$ *californicus* female mating and in a *californicus* male $\times$ *belkini* female mating copulation occurred readily, but insemination apparently was not successful for no eggs were laid.

Reproductive isolation could also be maintained by the difference in temporal distribution of the adults. The following rearings illustrate this mechanism: Of four penultimate individuals of *Misumenops* taken in a single collection in October near Cachuma Lake, three (one male and two females) were *belkini* and molted to maturity soon afterward (October to December). The fourth individual, a female *californicus*, diapaused until the following May before molting to maturity.

Importunus-belkini RELATIONSHIPS: *Importunus* is a northern, and *belkini* a southern, subspecies of the same species (map 28). Three types of evidence indicate that these subspecies are interbreeding where they come together: (1) a suggestion of a clinal grade in some of the diagnostic genitalic characters toward the *belkini* condition in southern *importunus*, (2) specimens of intermediate structure from an area midway between the main ranges of the subspecies, and (3) the *belkini* type of distal tooth of the RTA in some southern *importunus*. (The *belkini* type of distal tooth would thus appear to be a dominant character in this case as well as in the *belkini* $\times$ *deserti* cross, described above.)

Aikoe-belkini RELATIONSHIPS: There is no apparent indication that hybridization is occurring between these two sympatric species. In several experimental *aikoe* male $\times$ *belkini* female crossbreedings the male

was not attracted to the female. In the only *belkini* male $\times$ *aikoe* female crossbreeding attempted copulation occurred normally, but the F_1 progeny were not vigorous and all died without reaching maturity.

Aikoe-californicus RELATIONSHIPS: Although *aikoe* is apparently more closely related to *belkini* (their genitalia are strikingly similar) than to *californicus*, a *californicus* male $\times$ *aikoe* female cross resulted in an F_1 generation of which two males attained maturity, which is in contrast to the inviability in the F_1 of the *belkini* male $\times$ *aikoe* female cross.

Misumenops (Misumenops) dubius (Keyserling)

Misumena dubia KEYSERLING, 1880, pp. 90-91, pl. 2, fig. 48.

Misumenops dubius: F. PICKARD-CAMBRIDGE, 1900, p. 145. GERTSCH (in part), 1939, p. 325.

FEMALE: (Based on Californian forms only). Average length about 4.5 mm.

Allatal stripe usually lacking, when present brown, less than one-half of width of allatum; carapace setae pale. Legs without bands. Dorsum of abdomen whitish or yellowish, paramedial maculae usually present; ventral stripe not developed.

Epigynum (fig. 159): Median septum shorter than that of other species of *celer* group, in some cases only as long as diameter of intromittent orifice, septal arches not developed; intromittent orifice orbicular.

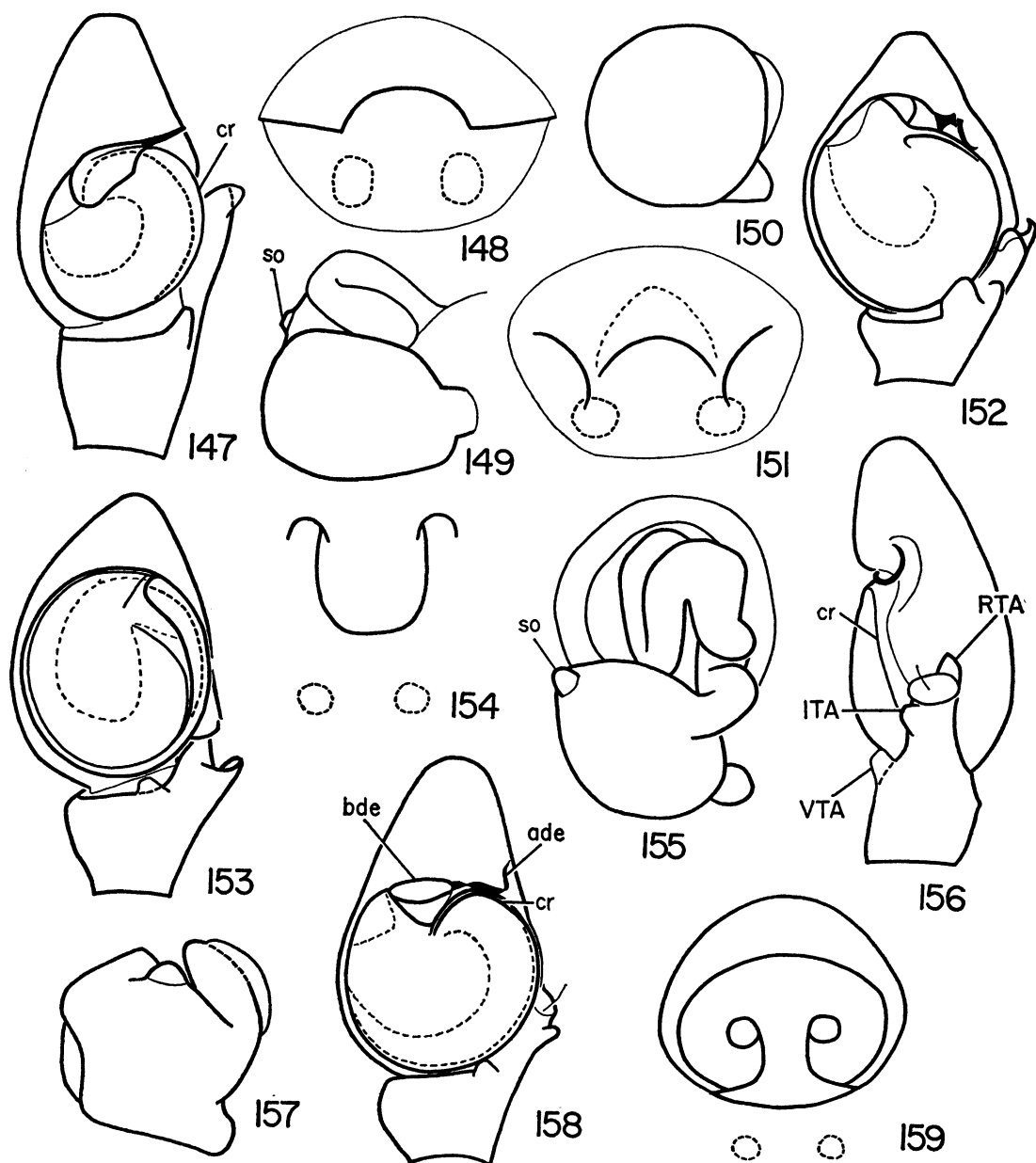
Receptaculum (fig. 157): Membranous bursa copulatrix very short, not visible dorsally; sclerotized bursa copulatrix short, not convoluted.

MALE: (Based on Californian material only). Average length 2.5-3.0 mm.

Allatal stripe brown or gray, less than one-half of width of allatum, or stripe not apparent. Paramedial maculae of abdomen not confluent longitudinally when developed; ventral stripe absent.

Palpus (figs. 156, 158): Length of tegulum 0.21-0.24 mm.; embolus originating near 315 degrees; apical division of embolus very short, less than one-half of width of tegulum; diameter of terminal spiral 0.03 mm. or less, visible in its entirety from a ventral view. Distal tooth of RTA shorter and less acuminate than that of other species of *celer* group.

TYPES: Syntypes, females, of *dubius* from



FIGS. 147–149. *Misumenoides formosipes* (Walckenaer). 147. Male palpus, ventral view. 148. Epigynum. 149. Receptaculum, dorsal view.

FIGS. 150–152. *Misumena vatia* (Clerck). 150. Receptaculum, dorsal view. 151. Epigynum. 152. Male palpus, ventral view.

FIGS. 153–155. *Misumenops oblongus* (Keyserling). 153. Male palpus, ventral view. 154. Epigynum. 155. Receptaculum, dorsal view.

FIGS. 156–159. *Misumenops dubius* (Keyserling). 156. Male palpus, retrolateral view. 157. Receptaculum, dorsal view. 158. Male palpus, ventral view. 159. Epigynum.

Abbreviations: ade, apical division of embolus; bde, basal division of embolus; cr, circumtegular ridge; so, spermathecal organ.

Mexico in Simon collection in the Museum National d'Histoire Naturelle in Paris (Gertsch, 1939, cites a female type in the British Museum, Keyserling collection).

DISTRIBUTION: Southwestern Mexico, from Guerrero (F. Pickard-Cambridge, 1900) northward into the southern United States, and from Mississippi and Nebraska (Gertsch, 1939) into southeastern California. The distribution in California is indicated in map 24.

SEASONAL DATA: Mature males have been taken in April through June; mature females, from April through September.

REMARKS: Californian *dubius* is drab compared to the brightly marked forms from other parts of its range.

Misumenops (Misumenops) rothi, new species

FEMALE: Average length about 5.0 mm.

Allatal stripe pale to dark brown, in some cases extending as far cephalad as clypeal margin in latter condition, about one-half of width of allatum or somewhat wider; carapace setae pale, primaries at least as long as PME interdistance. Legs I, II seldom with bands, presence of bands usually correlated with dark allatal stripe condition. Dorsum of abdomen whitish or yellowish, paramedial maculae infrequently developed, in life with bright red markings in some individuals; ventral stripe not developed.

Epigynum (fig. 162): Posterior rim of hood slightly concave to moderately convex; median septum typically shorter and broader than that in species of *celer* complex (cf. figs. 169, 183), arches distinct; intromittent orifice small, typically elliptical.

Receptaculum (figs. 163, 165): Membranous bursa copulatrix not convoluted, usually not visible dorsally; sclerotized bursa copulatrix intermediate in length between that of *dubius* and that of *aikoe* (cf. figs. 157, 186), usually with three or four convolutions.

MALE: Average length slightly less than 3.0 mm.

Allatal stripe usually brown, in some gray, slightly broader to less than one-half of width of allatum, infrequently not developed; carapace seta S1 shorter than T1 and about as stout; S3 and T5 longer than PME interdistance. Femora I and II usually pale and without pigmented spots, save for those at base

of principal spiniforms; leg bands in some cases indistinct, tibial band one-fourth to one-third of length of segment, basitarsal band usually about one-half of length of segment, telotarsal band rarely distinct. Paramedial maculae, when present, variable, large, pale, and diffuse or more compact and darker, confluent longitudinally or discrete; ventral stripe lacking.

Palpus (figs. 160, 161): Length of tegulum 0.25–0.30 mm.; embolus originating near 270 degrees, arched at its base and straight, in its intermediate portion which is oriented tangentially to distal margin of tegulum; basal arch typically more obtuse than that of the other members of the *rothi* complex; apical spiral about 0.06 mm. in diameter, just visible in its entirety from a ventral aspect, but this characteristic not so pronounced as in *dubius*.

TYPE: Holotype, male, Jacumba, San Diego County, California, June 14, 1957, D. Verity, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 25); Ildefonso Island, Gulf of California [specimens identified as *Misumenops celer* (Hentz) by Chamberlin, 1924].

SEASONAL DATA: Mature forms have been taken from March through September. In the low deserts, peak occurrence is apparently in March and April, but in other areas most collecting records date from April through July, particularly in June and July. An immature female taken in September showed a winter diapause, maturing the following March.

Misumenops (Misumenops) quercinus, new species

FEMALE: Average length 3.4 mm. (southern populations); 5.5 mm. (central and northern populations).

Allatal stripe dark gray or brownish, in some cases pale red, typically sparsely pigmented, very broad, much wider than one-half of width of allatum; carapace setae like those in *rothi*. Legs I and II with distinct bands. Dorsum of abdomen reddish or orange in appearance in life owing to presence of pigmented spots at base of setae; paramedial maculae present; ventral stripe in some cases developed.



MAP 25. Distributions of *Misumenops rothi*, new species, *M. quercinus*, new species, *M. sierrensis*, new species, *M. gabrielensis*, new species, and *M. schlingeri*, new species.

Genitalia similar to those of *rothi*.

MALE: Average length slightly less than 3.0 mm.

Allatal stripe dark gray, markedly broader than one-half of width of allatum, or allatum entirely pigmented; carapace setae similar to those of *rothi*. Femora I, II with numerous pigmented spots, in some cases approaching *gabrielensis* condition; leg bands broadly developed, tibial band slightly more than one-third of length of segment, basitarsal band usually slightly more or less than one-half, but may be as wide as two-thirds, of length of segment, telotarsal band usually distinct. Dorsum of abdomen with pigmented spot at base of setae; paramedial maculae rather characteristic in appearance, large, pale, and diffuse, confluent longitudinally or discrete; ventral stripe present or absent.

Palpus: Length of tegulum 0.26–0.30 mm.; embolus similar to that of *rothi* (see fig. 160), but apical division more strongly arched than that in typical *rothi* and diameter of terminal spiral larger, 0.08–0.09 mm.

TYPE: Holotype, male, Oak Flat Public Camp, Los Angeles County, California, April 19, 1959, Andrea Ann and R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 25).

ECOLOGY: *Quercinus* has been personally collected almost exclusively in Foothill Woodland and Northern Oak Woodland. In Foothill Woodland this spider is most common on blue oak, *Quercus douglasii* Hooker and Arnott, and in Northern Oak Woodland on Oregon oak, *Q. garryana* Douglas.

SEASONAL DATA: Mature specimens have been taken from April through August.

Misumenops (Misumenops) sierrensis,
new species

FEMALE: Average length about 5.0 mm.

Allatum usually uniformly light brown, but a brown allatal stripe, about one-half of width of allatum, in some cases developed; carapace setae pale, primary setae short, usually all markedly shorter than PME interdistance. Legs I, II with or without bands. Dorsum of abdomen whitish, in life in some instances with red markings, paramedial maculae present in some; ventral stripe not developed.

Genitalia like those of *rothi*.

MALE: Average length slightly more than 3.0 mm.

Allatal stripe usually brown, in some cases gray, one-half of width of allatum or somewhat wider; carapace seta T1 usually much shorter and more slender than S1; S3 and T5 usually shorter than PME interdistance. Femora I, II largely pale or invested with numerous small pigmented spots; bands well developed, tibial band more than one-third (nearly one-half) of length of segment, basitarsal band two-thirds, to nearly entire length, of segment, telotarsal band in every case distinct. Paramedial maculae of abdomen discrete or fused longitudinally; ventral stripe present or absent.

Palpus: Length of tegulum about 0.32 mm.; embolus similar to that of *rothi* (see fig. 160), but apical division more strongly arched than that in typical *rothi* and diameter of terminal spiral larger, 0.08–0.09 mm.

TYPE: Holotype, male, Woodfords, Alpine County, California, April 19, 1958, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: California (map 25); Oregon.

SEASONAL DATA: Adults have been taken in June and July.

Misumenops (Misumenops) gabrielensis,
new species

FEMALE: Average length about 6.0 mm.

Allatal stripe about one-half of width of allatum; carapace setae like those of *rothi*. Anterior legs with pale bands. Dorsum of abdomen whitish, in some cases with paramedial maculae; ventral stripe not developed. Orange spot present at base of dorsal abdominal setae.

Genitalia like those of *rothi*.

MALE: Average length 3.0–3.5 mm.

Allatal stripe gray or dark brown, about one-half of width of allatum or less; carapace setae like those of *rothi*. Femora I, II with conspicuous investment of reddish to brownish spots often so densely developed on pro-lateral side as to form a longitudinal stripe; leg bands distinct, tibial band one-third of, or more than, length of segment, basitarsal band distinct. Paramedial maculae of abdomen confluent longitudinally; ventral stripe pres-

ent in some cases. Orange spot present at base of dorsal abdominal setae.

Palpus (figs. 166, 167): Length of tegulum 0.42–0.44 mm. Embolus similar to that of *rothi* (cf. fig. 160), but apical division more strongly arched than that of typical *rothi* and diameter of terminal spiral larger, 0.12–0.17 mm.

TYPE: Holotype, male, Tanbark Flat, San Gabriel Mountains, Los Angeles County, California, June 20, 1952, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 25).

ECOLOGY: *Gabrielensis* occurs chiefly in broad-leaved understory vegetation of riparian woodland surrounded by chaparral.

SEASONAL DATA: Mature specimens have been taken from April through August. One very young immature male collected in July underwent a winter diapause and matured the following March; however, a male taken in the penultimate instar in October molted to maturity in the next month.

Misumenops (Misumenops) schlingeri,
new species

Runcinia californica BANKS, 1900, p. 99. Secondary homonym of *Misumena californica* Banks, 1898 (= *Misumenops californicus*). Synonymy with *Misumenops dubius* (Keyserling, 1880) by Gertsch, 1939, disclaimed.

FEMALE: Average length 6.0–6.5 mm.

Allatal stripe less than one-half of width of allatum, dark brown; principal carapace setae like those of *rothi*. Legs typically with bands. Dorsum of abdomen characteristically marked with broad stripes, as follows, which are red in life (but which apparently transform into black in alcohol): (1) one pair of stripes lateral, originating at anterior dorso-lateral margin of abdomen and curving ventrad halfway back on abdomen where they terminate, (2) a paramedial pair with a common origin on dorsum of abdomen near anteriomedial margin, diverging caudad until halfway back on abdomen and then converging to meet just before anal tubercle, (3) two pairs of oblique bilateral stripes extending laterocaudad from paramedial stripes, paralleling the ventrally curving portion of the lateral stripes and terminating at same level as latter; stripes in some pale, in which case only

paramedial pair remaining distinct. Ventral stripe reduced to a posterior macula or absent.

Epigynum: Median septum narrower than that of *rothi*; intromittent orifices large and placed close to median septum.

Receptaculum: Similar to that of *rothi*.

MALE: Average length about 4.0 mm.

Allatal stripes dark brown, less than one-half of width of allatum; carapace chaetotaxy like that of *rothi*. Femora I and II pale and without pigmented spots (save for those at base of principal spiniforms) or sparsely spotted ventrally; distal leg bands distinct, tibial band one-third of length of segment, or slightly more, basitarsal band from slightly greater than one-half to three-quarters of the length of the segment. Dorsal abdominal markings like those of female; oblique stripes (i.e., the third set of stripes in the female description above) in some cases not joined to paramedial stripes, only the more lateral (i.e., ventral) portion persisting (in one of the six specimens examined only the lateral portion of oblique stripes remains as characteristic markings); paramedial maculae variable, not apparent, or developed as discrete black spots in red paramedial stripes, or (in atypical specimen mentioned above) fused to form posterior stripes; ventral stripe absent in all but one of the six specimens.

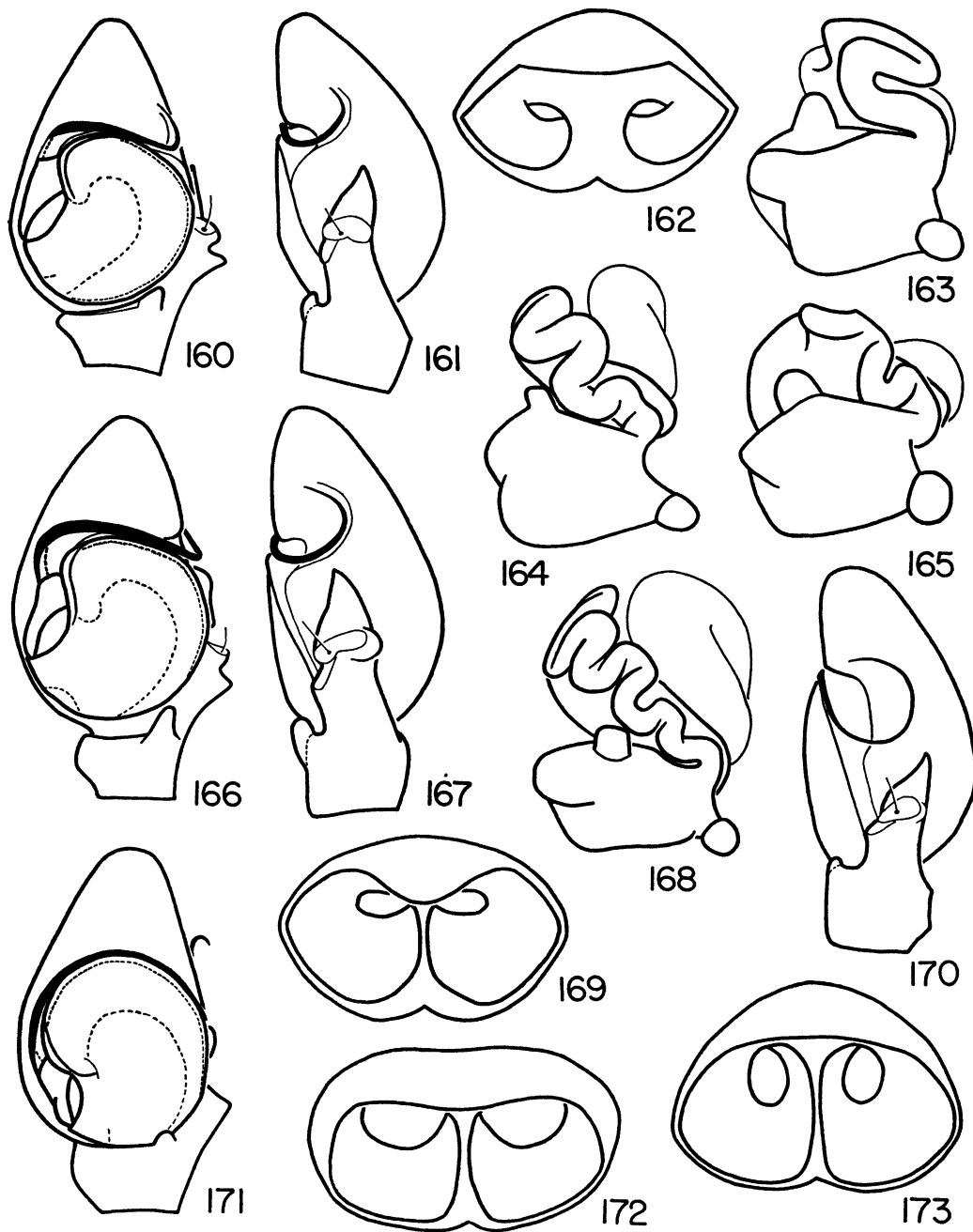
Palpus: Length of tegulum 0.31–0.36 mm.; embolus similar to that of *rothi*, but arch of apical division variable in angulation, from typical *rothi* type (see (fig. 160) to *gabrielensis* type (see fig. 166) and diameter of terminal spiral larger, 0.10–0.17 mm.

TYPES: Syntypes of *Runcinia californica* Banks, two females*, Los Angeles, California, N. Banks, in Museum of Comparative Zoölogy. Holotype, female, of *schlingeri*, Mountain Home, San Bernardino County, September 12, 1957, E. I. Schlinger, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 25).

ECOLOGY: I have taken *schlingeri* by sweeping low, flowering vegetation, often among dry grass.

SEASONAL DATA: Adult males have been taken in July; females, in September. Laboratory-reared males taken in the penultimate instar in July molted to maturity in



FIGS. 160–163. *Misumenops rothi*, new species. 160. Male palpus, ventral view. 161. Male palpus, retrolateral view. 162. Epigynum. 163. Receptaculum, dorsal view.

FIG. 164. *Misumenops lepidus* (Thorell), receptaculum, dorsal view.

FIG. 165. *Misumenops rothi*, new species, receptaculum, dorsal view.

FIGS. 166, 167. *Misumenops gabrielensis*, new species. 166. Male palpus, ventral view. 167. Male palpus, retrolateral view.

FIG. 168. *Misumenops californicus* (Banks), receptaculum, dorsal view.

FIGS. 169–171. *Misumenops lepidus* (Thorell). 169. Epigynum. 170. Male palpus, retrolateral view. 171. Male palpus, ventral view.

FIGS. 172, 173. *Misumenops californicus* (Banks), epigyna.

August; immature females taken at the same time became mature in September and October.

Misumenops (Misumenops) celer (Hentz)

Thomisus celer HENTZ, 1847, p. 446, pl. 23, fig. 5.

Misumenops celer: PETRUNKEVITCH, 1911, p. 411. GERTSCH (in part), 1939, p. 322.

FEMALE: (Based on desert forms). Average length about 4.5 mm.

Pars cephalica width index 5.3–5.6; allatal stripe light to dark brown, about one-half of width of allatum, or allatal stripe not developed, allatum uniformly light brown; mesodiscus not glossy; carapace setae pale, primaries at least as long as PME interdistance; seta T4 typically absent. Sternum pale. Legs I, II without bands; femora and tibiae without metallic luster below; tibiae I, II with one or more pairs of ventral spiniforms in basal half. Abdominal paramedial maculae present or absent; ventral stripe not developed.

Genitalia similar to those of *lepidus* (see fig. 169) except that hood not so strongly convex behind as that of typical *lepidus*.

MALE: (Based on desert forms). Average length about 3.0 mm.

Allatal stripe narrow, gray, less than one-half of width of allatum, or not developed, allatum uniformly brown. Sternum pale. Bands of legs I, II typically distinct and red, width of basitarsal band less, to somewhat more, than one-half of length of segment. Dorsum of abdomen with paramedial maculae developed as small discrete spots; interpulmonary integument pale, typically concolorous with rest of venter; ventral stripe lacking.

Palpus: Similar to that of *lepidus* (see fig. 171), but embolus originating on prolateral side of tegulum, farther apically than usual in *lepidus*; terminal spiral not visible in its entirety ventrally, diameter 0.09–0.10 mm. Distal tooth of RTA less acuminate than that of *lepidus*.

DEVIAE: Female (Saratoga Springs, San Bernardino County): Carapace with longitudinal white lines as in *deserti*; anterior legs banded; caudal margin of hood strongly convex, as in *lepidus*.

TYPE: South Carolina, North Carolina,

Massachusetts, Alabama, Ohio, and so on, all given as localities. "Type presumably destroyed" (Gertsch, 1939).

DISTRIBUTION: This spider is common in the southern United States and northern Mexico and, based on the data in Gertsch (1939), may also occur in Central America and the West Indies. The distribution in California is shown in map 26.

SEASONAL DATA: Two females have been collected in April and May.

REMARKS: The distal tooth of eastern *celer* is quite short but tends to become longer in forms toward the west.

According to Chamberlin and Ivie (1944) *celer* is a synonym of *delphinus* Walckenaer, 1837, but Abbott's figure is not shown in their publication.

Misumenops (Misumenops) lepidus (Thorell)

Diaea lepida THORELL, 1877, p. 498. Synonymy with *celer* by Gertsch, 1939, disclaimed.

Misumena diegoi KEYSERLING, 1887, p. 481. Synonymy with *celer* by Gertsch, 1939, disclaimed.

Misumenops lepidus: PETRUNKEVITCH, 1911, p. 412.

Misumenops celer: GERTSCH (in part), 1939, p. 322.

FEMALE: Average length about 5.0 mm.

Pars cephalica width index 5.0–5.9, usually 5.3; allatal stripe light gray, less usually pale to moderately dark brown, broader than one-half of width of allatum, allatum in some cases nearly entirely pigmented; mesodiscus not glossy; carapace setae dark, primaries at least as long as PME interdistance; secondary vestiture not so well developed as that of *i. importunus* or that of *i. belkini*; one strong spiniform developed just caudad of seta S1 or a strong spiniform lacking, rarely two present; T4 typically present. Sternum pale. Legs I, II without bands, venter of femora and tibiae without metallic luster, tibiae with one or more pairs of ventral spiniforms in basal half. Dorsum of abdomen usually white, in some cases yellow, in life often with bright red markings, paramedial maculae present; ventral stripe not developed.

Epigynum (fig. 169): Posterior rim of hood typically more strongly convex than in other species of the group; median septum narrower than that of *i. importunus* or that of *i. bel-*



MAP 26. Distributions of *Misumenops celer* (Hentz) and *M. lepidus* (Thorell).

kini, extending cephalad to beneath the hood or nearly so; intromittent orifice distinct, elliptical, typically set close to median septum, in which case arch of median septum not present or arch well developed and orifices situated at tip, well lateral to septum as in *californicus* (see fig. 173).

Receptaculum (fig. 164): Membranous bursa copulatrix longer than that of the previous species, visible for much of its length from a dorsal aspect, with a convolution; sclerotized bursa copulatrix usually with three or four convolutions; intromittent division more erect than that of *belkini* or that of *aikoe* (cf. figs. 184, 186); spermatheca usually about one and one-half times as broad as long.

MALE: Average length about 3.0 mm.

Allatal stripe distinct, usually grayish, often with reddish tint, less often brownish, variable in width, about one-half of width of allatum. Sternum pale. Bands of legs I and II usually distinct, red, basitarsal band usually one-half to two-thirds of length of segment. Paramedial maculae of abdomen confluent longitudinally; interpulmonary integument pale, typically concolorous with remainder of venter; ventral stripe, when very rarely developed, reduced.

Palpus (figs. 170, 171): Length of tegulum 0.30–0.35 mm.; embolus typically originating near 225 degrees, but in some cases as far basally as slightly retrolateral to the level of the prolateral edge of the tibia (similar to the condition in *i. importunus*); terminal spiral not visible in its entirety from a ventral aspect, diameter 0.10–0.14 mm. (see Deviate, below). Distal tooth of RTA more acuminate than that in *celer*.

DEVIATE: Male (Willits, Mendocino County): Embolus originating near 180 degrees, diameter of spiral 0.18 mm. (in the lower range of *californicus*); basitarsal band as broad as nearly entire length of segment. This specimen was associated with typical males.

TYPES: Holotype, male, of *lepidus* from American Fork Canyon, Utah, July 22, A. S. Packard, presumably in Stockholm Museum (Gertsch, 1939). Holotype, male*, of *diegoi* from San Diego, California, in United States National Museum.

DISTRIBUTION: Based on records listed in

Gertsch (1939) under *celer*, *lepidus* would appear to be widely distributed in the Pacific northwest as far north as British Columbia. The distribution in California is shown in map 26.

SEASONAL DATA: Mature individuals have been taken from March through September but most abundantly from April through July. Based on rearings, maturation of winter immatures from the Sierran and Monoan districts occurs in April and May, but in areas of lower elevation in March.

REMARKS: *Lepidus* and *californicus* are very similar in facies but usually can be separated on the basis of the genitalia.

Misumenops (Misumenops) deserti,
new species

Misumena modesta BANKS (female syntype, not male lectotype), 1898, p. 262.

FEMALE: Average length between 6.0–6.5 mm.

Pars cephalica width index 4.8–5.3, in the great majority 5.0; clypeal-prodiscal area with a median white area typically broadening toward and reaching clypeal margin; carapace with several pairs of longitudinal white lines (not so prominent in life) as follows: (1) through setae A1 and A2, (2) through S1, (3) through S3 and outlining mesodiscus, (4) paramedial on discus, and (5) medial on discus; allatum entirely pigmented or with a mesial stripe of variable width and distinctness, pale to very dark brown, in some cases greenish or reddish in life; mesodiscus usually highly glossy (Saltonian District) or reflecting light diffusely (Mojavian, Monoan, Great Valley districts); carapace setae pale to dark, primaries at least as long as PME interdistance; secondary setal vestiture typically not so well developed as that in *lepidus*, *californicus*, *i. importunus*, or *i. belkini*; usually only one strong spiniform developed just caudad of seta S1; T4 typically not present. Sternum usually pale. Legs I, II in some cases with pale bands and ventral and prolateral lines on the patellae and tibiae (best developed in forms from Saltonian District) more conspicuous than usual in other species of the *celer* group; venter of femora and tibiae without metallic luster; tibiae with one or more pairs of ventral spiniforms in basal half. Abdominal markings very variable.

Epigynum: Like that of *californicus*.

Receptaculum: Two types of receptacula can be recognized. Type A is similar in proportions to that of *lepidus* (see fig. 164), but larger, or to that of *aikoeae* (see fig. 186); the variation in proportions was not analyzed. Type B is apparently identical to the receptacula of *californicus* (see fig. 168).

MALE: Average length slightly more than 3.0 mm. (Saltonian District), 3.5–4.0 mm. (Mojavian District), 4.0 mm. (Great Valley District).

Allatal stripe, when present, pale to dark brown or grayish, variable in width. Sternum pale. Leg bands not apparent or indistinct, pale red to pale brown (Saltonian District), distinct, bright red to pale brown or not apparent (Mojavian District), usually distinct and bright red (Great Valley District). Paramedial maculae of abdomen large and usually discrete, rarely, anterior two pairs confluent longitudinally or maculae variously reduced or absent, in latter case abdomen entirely creamy white, in some cases pale yellowish green; interpulmonary integument typically pale, concolorous with remainder of venter; ventral abdominal stripe lacking.

Palpus: Similar to that of *californicus* (see figs. 175–177) but embolus tending to originate farther apically from slightly prolateral to slightly retrolateral to median longitudinal plane of tibia, occasionally as far retrolaterally as level of VTA. Length of tegulum 0.36–0.42 mm. (Saltonian District), 0.39–0.54 mm. (Mojavian, Great Valley Districts); diameter of terminal embolar spiral 0.15–0.20 mm. (Saltonian District), 0.18–0.21 mm. (Mojavian District), 0.20–0.24 mm. (Great Valley District).

DEVIATES: Female (near Hopkin's Well, Riverside County), female (El Centro, Imperial County), females (Yuma, Arizona): Genitalia variable in size, approaching the small size of those of *celer*.

TYPES: Holotype, male, of *deserti* from Thousand Palms Canyon, Riverside County, California, March 20, 1954, R. X. Schick, in the American Museum of Natural History. Syntype, female, of *modesta** from Mexico (lectotype = *Misumena vatia*), in the Museum of Comparative Zoölogy.

DISTRIBUTION: Southwestern United States and adjacent parts of Mexico. The

distribution in California is indicated in map 27.

SEASONAL DATA: Mature individuals have been taken from January through September in the southernmost portion of the Saltonian District; from March through September, farther north in the Saltonian and Mojavian districts; and from June through October, in the Monoan, Great Valley, and coastal districts (with the exception of a male collected in March at Davis, Yolo County).

REMARKS: *Deserti* is a species highly variable in coloration and markings as well as showing the two types of receptacula. The holotype female, typical of the forms from the Saltonian District, is characterized by a general pale coloration, lack of distinct body and leg markings (although a dark allatal stripe may be present), a highly glossy mesodiscus, pale carapace setae, and a type-B receptaculum. (However, in the Coachella Valley [northern Saltonian District] the mesodiscus of the female may not be glossy and a type-A receptaculum may be developed.) A typical male from the Saltonian District is characterized by the highly glossy mesodiscus and the absence of dark leg bands.

Individuals of *deserti* from the Mojavian and Great Valley districts differ from the typical forms of the Saltonian District in the duller mesodiscus of the female, the generally larger size of the male, and the presence of distinct leg bands in the male. These differences are especially marked in the Great Valley District.

There is a tendency for the female to become darker in the Yuman District. In collections from the Yuma area this tendency is pronounced, and the allatal stripe is very dark, broad, and elongate, extending cephalad to the margin of the clypeus; the anterior femora may be entirely dark, and the anterior tibiae and basitarsi have broad, dark bands; the abdomen is distinctly marked. In many of the dark forms the glossiness of the mesodiscus is variably reduced (but the mesodiscus may not be glossy even in pale specimens). The predominant type of receptaculum in this area is a larger version of the *celer* type (type A), but in some specimens the receptaculum is smaller and may approach that of *celer* in size.

A dark form, occurring in coastal northern



MAP 27. Distributions of *Misumenops deserti*, new species, and *M. californicus* (Banks).

Baja California, differs from the Yuman type in that, in both sexes, the carapace setae are black, a ventral abdominal stripe is present, and the mesodiscus is very dull (a rare character for a *Misumenops* male). The receptaculum is also type A.

**Misumenops (Misumenops)
californicus (Banks)**

Misumena californica BANKS, 1896, p. 91.

Misumessus pallidulus BANKS, 1904b, p. 112.
Synonymy by Gertsch, 1939.

Misumenops californicus: PETRUNKEVITCH, 1911, p. 410. GERTSCH (in part), 1939, p. 326.

FEMALE: Average length about 5.5 mm.

Pars cephalica width index 5.0–5.6, usually 5.3. Markings, coloration, and chaetotaxy typically identical to those of *lepidus*, but in some cases legs I and II with indistinct bands and abdomen with a weakly developed ventral stripe.

Epigynum (figs. 172, 173): Posterior rim of hood not so convex as that of *lepidus*, in some cases weakly concave; median septum longer than that of *i. importunus* or that of *i. belkini*; intromittent orifices usually large, broader than long, and extending beneath hood (fig. 172), in some cases smaller, longer than broad, and not extending beneath hood (fig. 173).

Receptaculum (fig. 168): Membranous bursa copulatrix longer than that of *lepidus* (cf. fig. 164); sclerotized bursa copulatrix proportionately longer (in relation to width of spermatheca) than that of other species of *celer* complex, with at least six convolutions; intromittent division more erect than that in *i. belkini* or *aikoe* (cf. figs. 184, 186); spermatheca about twice as broad as long.

MALE: Average length about 3.0–3.5 mm.

Allatal stripe broader than one-half of width of allatum, typically dark gray but in some cases moderate to dark brown; mesodiscus glossy. Sternum pale. Legs I, II usually with bands distinct, typically dark gray, less frequently red or pale brown, basitarsal band usually longer than that of *i. importunus* or that of *i. belkini*, about two-thirds of length of segment. Dorsum of abdomen typically gray but may be entirely white (except for paramedial maculae); paramedial maculae large and dark, usually situated in paler gray

paramedial stripe, confluent longitudinally; interpulmonary integument pale straw color, not contrasting strongly with the pale areas of rest of venter; ventral abdominal stripe usually present.

Palpus (figs. 175–177): Length of tegulum 0.36–0.44 mm., usually about 0.39 mm.; embolus originating at proximal margin of tegulum from slightly retrolateral to level of median axis of tibia to slightly retrolateral to VTA, usually slightly prolateral to VTA; truncus, as viewed prolaterally, typically broader than that in *i. importunus*, *i. belkini*, or *aikoe* and not tapering so abruptly; diameter of terminal spiral 0.19–0.23 mm. Distal tooth of RTA less acuminate than that in *i. belkini* or *aikoe*.

DEVIATES: Males (Mt. Diablo, Contra Costa County): Length of tegulum ranging downward to 0.35 mm. (not included in range of above description), embolus originating as far prolaterally as near level of prolateral margin of tibia, diameter of terminal spiral as little as 0.15 mm. These three characters either lie in or approach the range of *lepidus*.

TYPES: Holotype, female*, of *californicus* from Los Angeles, California, in the Museum of Comparative Zoölogy. Holotype, female*, of *pallidulus* from San Francisco, California, in the Museum of Comparative Zoölogy.

DISTRIBUTION: Gertsch (1939) and other authors record *californicus* from Texas, Colorado, Arizona, Utah, and Mexico. These identifications must be taken with reservation, since the species of *Misumenops* has been confused in the past. I am inclined to think that at least some of the above are *deserti*. The specimens I have seen that are definitely *californicus* have been taken only in California (map 27).

SEASONAL DATA: Mature forms have been taken from March through August but are most abundant in April, May, and June.

REMARKS: *Californicus* can usually be distinguished from *i. importunus* and *i. belkini* on the basis of general coloration. *Californicus* is gray, and the latter two forms are pale brown. Unfortunately I have been unable to determine the holotype of *pallidulus* on this basis (the receptaculum was not examined). Thus, the synonymy of *pallidulus* with *californicus* is uncertain.

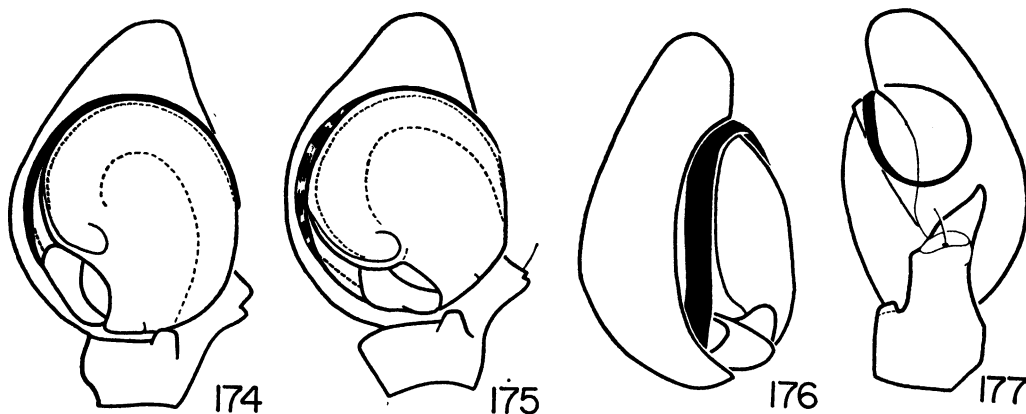


FIG. 174. *Misumenops importunus importunus* (Keyserling). Male palpus, ventral view.
FIGS. 175-177. *Misumenops californicus* (Banks). 175. Male palpus, ventral view. 176. Cymbium and bulb, prolateral view. 177. Male palpus, retrolateral view.

***Misumenops (Misumenops) importunus importunus* (Keyserling)**

Misumena importuna KEYSERLING, 1881, pp. 307-308, pl. 11, fig. 25.

Misumenops importunus: PETRUNKEVITCH, 1911, p. 412.

FEMALE: Average length about 7.0 mm.

Pars cephalica width index 4.2-4.7, usually about 4.5; clypeal-prodiscal region with a median white area typically narrowing cephalad and not reaching clypeal margin (as contrasted to *deserti*); allatal stripe, when developed, pale to moderate brown (gray in some reared forms), about one-half of width of allatum or less; white longitudinal carapace lines, characteristic of *deserti*, usually not present; mesodiscus not glossy; carapace setae usually pale, primaries as long as or longer than PME interdistance, secondary spiniforms tending to be stronger and more numerous than those in *celer*, *lepidus*, *deserti*, or *californicus*; allatum with two to four strong spiniforms just caudal to seta S1; T4 typically present. Sternum pale. Legs pale, lacking distinct bands, venter of femora and tibiae I, II without metallic luster; tibiae I, II with two or three strong pro-ventral spiniforms in basal half. Dorsum of abdomen whitish to pale yellow, in life often with faint red areas corresponding to the bright red markings of *lepidus* and *californicus*, rarely with paramedial maculae; ventral stripe usually absent, weakly developed when present.

Epigynum: Usually similar to that of *i.*

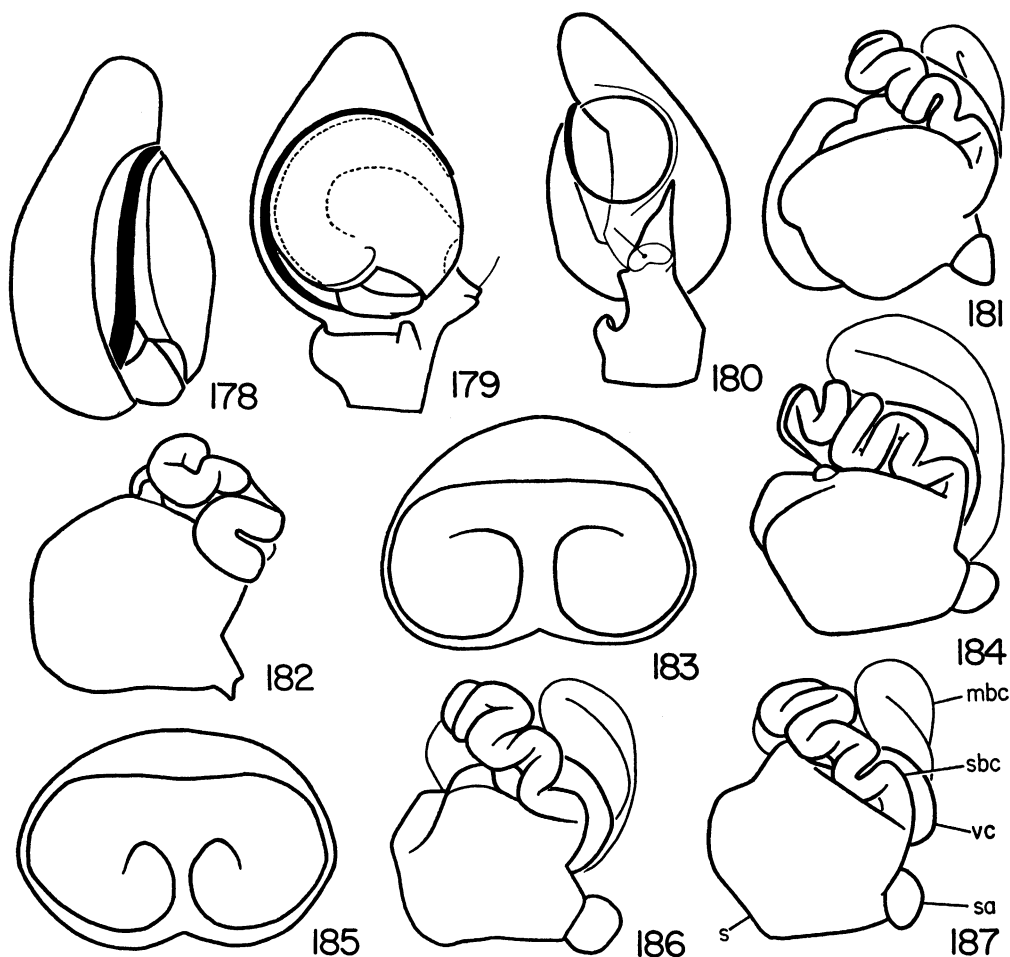
belkini (see fig. 183) but the width of the median septum in some cases much greater.

Receptaculum: Extremely variable, usually similar to receptaculum of *aikoeae* (see fig. 186). In the San Francisco Bay area there is a tendency for the membranous bursa copulatrix to become reduced in size, the intromittent division to become more erect, and the spermatheca to become larger and proportionately more elongate (fig. 181). Some of these tendencies reach an extreme in a specimen from Mt. Diablo: the membranous bursa copulatrix is greatly reduced, not convoluted or visible dorsally, and the spermatheca is about as long as broad (fig. 182). Figure 187, taken from an unnamed Arizonan species, represents a receptaculum intermediate between the first two described types.

MALE: Average length about 3.5 mm.

Allatal stripe brown or grayish, narrow, less than one-half of width of allatum. Bands of legs I, II usually narrow and less distinct than those in *lepidus* or *californicus*, pale brown to reddish, somewhat broader than one-half of length of segment or less. Sternum pale. Dorsum of abdomen with general brownish appearance; paramedial maculae, when developed, not confluent longitudinally but often situated in pale brown paramedial stripe and thus may appear confluent; interpulmonary integument pale, concolorous with rest of venter; ventral stripe rarely developed.

Palpus (fig. 174): Length of tegulum 0.36-0.42 mm.; embolus originating on prolateral side of proximal margin of tegulum near pro-



FIGS. 178-180. *Misumenops aikoae*, new species. 178. Cymbium and bulb, prolateral view. 179. Male palpus, ventral view. 180. Male palpus, retrolateral view.

FIGS. 181, 182. *Misumenops importunus importunus* (Keyserling). Receptacula, dorsal view.

FIGS. 183, 184. *Misumenops importunus belkini*, new subspecies. 183. Epigynum. 184. Receptaculum, dorsal view.

FIGS. 185, 186. *Misumenops aikoae*, new species. 185. Epigynum. 186. Receptaculum, dorsal view.

FIG. 187. *Misumenops* sp. (an unnamed species from Arizona), receptaculum, dorsal view.

Abbreviations: mbc, membranous bursa copulatrix; s, spermatheca; sa, spermathecal apodeme; sbc, sclerotized bursa copulatrix; vc, ventral canal.

lateral edge of tibia; truncus, as seen prolaterally, similar to that of *i. belkini* and *aikoae* (see fig. 178), typically narrower and tapering more abruptly than that of *deserti* or that of *californicus* (cf. fig. 176); diameter of terminal spiral 0.18-0.21 mm. Distal tooth of RTA typically similar to that of *californicus* or that of *deserti*, but in some cases acuminate as in *i. belkini*.

DEVIATE: Male (Abbott, Monterey County): Embolus originating at proximal

margin of tegulum, intermediate in origin between typical *i. importunus* and *i. belkini*.

TYPE: Holotype, female*, San Mateo, California, in the Museum of Comparative Zoölogy.

DISTRIBUTION: California (map 28); Washington (Fort Lewis).

SEASONAL DATA: Mature individuals have been taken virtually throughout the year, but most commonly during spring. Reared specimens of *i. importunus*, however, like those of



MAP 28. Distributions of *Misumenops importunus importunus* (Keyserling) and *M. i. belkini*, new subspecies.

i. belkini, show a summer and fall diapause.

REMARKS: The variation in the structure of the receptaculum may be a reflection of previous isolation of San Francisco Bay and Mt. Diablo populations. Curiously, there appear to be no corresponding modifications in the male palpus.

**Misumenops (Misumenops) importunus
belkini**, new subspecies

FEMALE: Average length about 5.5 mm.

Pars cephalica width index 4.3–5.0, usually about 4.7, otherwise markings, coloration, and chaetotaxy like those of *i. importunus*.

Epigynum (fig. 183): Arch of median septum not extending to beneath hood; intromittent orifice typically slitlike, in some cases developed as a small round aperture at tip of arch.

Receptaculum (fig. 184): Similar to that of *aikoe* (see fig. 186), but intromittent division usually more recumbent and membranous bursa copulatrix more elongate, these two characteristics in some instances reaching an extreme, as shown in figure 184.

MALE: Average length 3.0–3.5 mm.

Markings and coloration similar to those of *i. importunus*, but allatal stripe invariably brown and interpulmonary integument typically orangish brown and darker than rest of venter (except for ventral stripe, typically present).

Palpus: Like that of *aikoe* (see figs. 178–180), but tegulum usually larger (0.36–0.42 mm.), embolus usually originating farther apically (from slightly retrolateral to medial axis of tibia to retrolateral to VTA), and terminal spiral of embolus usually larger (0.21–0.23 mm.).

DEVIATES: Female (Cuyama, Santa Barbara County): Length 7.75 mm. Pars cephalica width index 4.6 (in the *belkini* range); clypeal-prodiscal area with medial white marking broadening cephalad and reaching clypeal margin and carapace with longitudinal white lines as in *deserti* (*deserti*-like); mesodiscus not glossy; carapace chaetotaxy like that of typical *belkini*. Legs pale, without bands. Dorsum of abdomen whitish, lacking paramedial maculae. Epigynum similar to that of *deserti*. Receptaculum of typical *belkini* type. *Deserti* and *belkini* are probably sympatric in the Cuyama area.

TYPE: Holotype, male, Big Tujunga Canyon, San Gabriel Mountains, Los Angeles County, California, January 15–22, 1956, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 28).

SEASONAL DATA: Mature specimens have been taken throughout most of the year except in the months of August and September, most commonly from January through April, and especially in March. Specimens collected in late spring or summer undergo a pronounced diapause and molt to maturity in late fall or early spring.

Misumenops (Misumenops) aikoe,
new species

FEMALE: Average length about 5.5 mm.

Pars cephalica width index 5.0–5.3, 5.0 in the great majority of cases; clypeus and allatum entirely dark brown; interocular area pink to brown; mesodiscus not glossy; primary carapace setae reduced in length, all discal and caudoallatal setae markedly shorter than PME interdistance. Sternum brown. Legs I, II pale to dark brown or greenish, with distinct bands, venter of femora and tibiae with greenish or bluish metallic luster; tibiae lacking prominent ventral spiniforms in basal half or, less usually, with only one, occasionally with a lateral spiniform; basitarsi with one or two prolateral spiniforms. Abdomen more angulate caudolaterally than in other species of *Misumenops*; dorsum pale to dark, orange, mahogany-colored, or brown, with three anterior black spots arranged in a triangular configuration; paramedial maculae large and distinct, bar-shaped, anterior two pairs oblique but more posterior maculae horizontal and nearly contiguous mesially; ventral stripe typically present and usually broad and long, extending from epigastric furrow to base of spinnerets.

Epigynum (fig. 185): In some cases indistinguishable from that of *i. importunus* and *i. belkini*. Median septum typically narrower and shorter than that of *i. importunus* or that of *i. belkini*; arch usually characteristically rather sharply angulate; intromittent orifice usually slitlike.

Receptaculum (fig. 186): Membranous and sclerotized bursae copultrices proportion-

ately shorter (in relation to width of spermatheca) than those of *californicus* (cf. fig. 168); sclerotized bursa copulatrix with at least six convolutions; intromittent division more recumbent than that of *lepidus* or *californicus* (see figs. 164, 168); spermatheca about one and one-half times as broad as long. Length of membranous bursa copulatrix and degree of recumbency of intromittent division showing variation toward *i. belkini* condition, in some cases reaching extreme form of *i. belkini* (see fig. 184).

MALE: Average length about 3.0 mm.

Allatum entirely dark brown; interocular area reddish to white; mesodiscus brown. Sternum brown. Legs I, II pale to moderately dark brown, bands usually distinct, basitarsal band about two-thirds of length of segment. Dorsum of abdomen brown, in some cases with a broad, medial, black stripe characteristically emarginate near middle (owing to insertion of pair of bar-shaped white markings); paramedial maculae and ventral stripe like those of female; interpulmonary integument dark.

Palpus (figs. 178–180): Length of tegulum 0.33–0.37 mm.; embolus originating at proximal retrolateral side of tegulum, at level of VTA or, more commonly, farther retrolaterally; prolateral portion of truncus narrower and more abruptly tapering than that of *californicus* (cf. fig. 176); diameter of terminal spiral 0.20–0.21 mm. Distal tooth of RTA with a discrete narrow and acuminate apical portion, identical to that of *i. belkini*.

DEVIATE: Female (Mint Canyon, Los Angeles County): Pars cephalica width index 4.1; clypeus not dark; sternum pale.

TYPE: Holotype, male, Sepulveda Canyon, Santa Monica Mountains, Los Angeles County, California, July 1, 1958, V. Roth, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 29).

ECOLOGY: This species has been collected in greatest abundance in the Californian districts in chaparral.

SEASONAL DATA: Mature forms have been taken from April through July, most commonly in June.

REMARKS: This very handsome species is named for my wife, Aiko.

Asperatus GROUP

Male palpus: Basal division of embolus without a dorsal spine; embolus terminating in a single spiral or as a helix; truncus stout, conspicuously twisted. Cymbium deeply emarginate on retrolateral side. Distal tooth of RTA apical in position. Receptaculum: Not rotated from position typical of genus.

At least three species of this group occur in the United States, *M. asperatus* (Hentz), *M. verityi*, new species, and *M. devius* Gertsch, the last two from California. *Asperatus* is cited from California from a single record in the 1939 revision of Gertsch (Claremont, Los Angeles County), but this is a doubtful record.

Misumenops (*Misumenops*) *verityi*, new species

FEMALE: Average length about 5.5–6.0 mm.

Allatum orange-red to dark brown, often with lateromarginal white markings. Dorsum of abdomen pale orange or reddish to black, with paramedial maculae or a broad median black stripe; ventral stripe usually present.

Epigynum (fig. 189): Posterior margin of hood usually concave; median septum in some cases obscure, narrower than that of *devius*; intromittent orifice smaller and situated farther laterally than that of *devius*.

Receptaculum (fig. 190): Intromittent divisions not conjoined; membranous bursae copulatrices distinguishable; sclerotized bursa copulatrix pale, translucent.

MALE: Average length about 3.5 mm.

Coloration and markings similar to those of female.

Palpus (fig. 188): Embolus terminating in an acuminate flat spiral in which the pars pendula is broad.

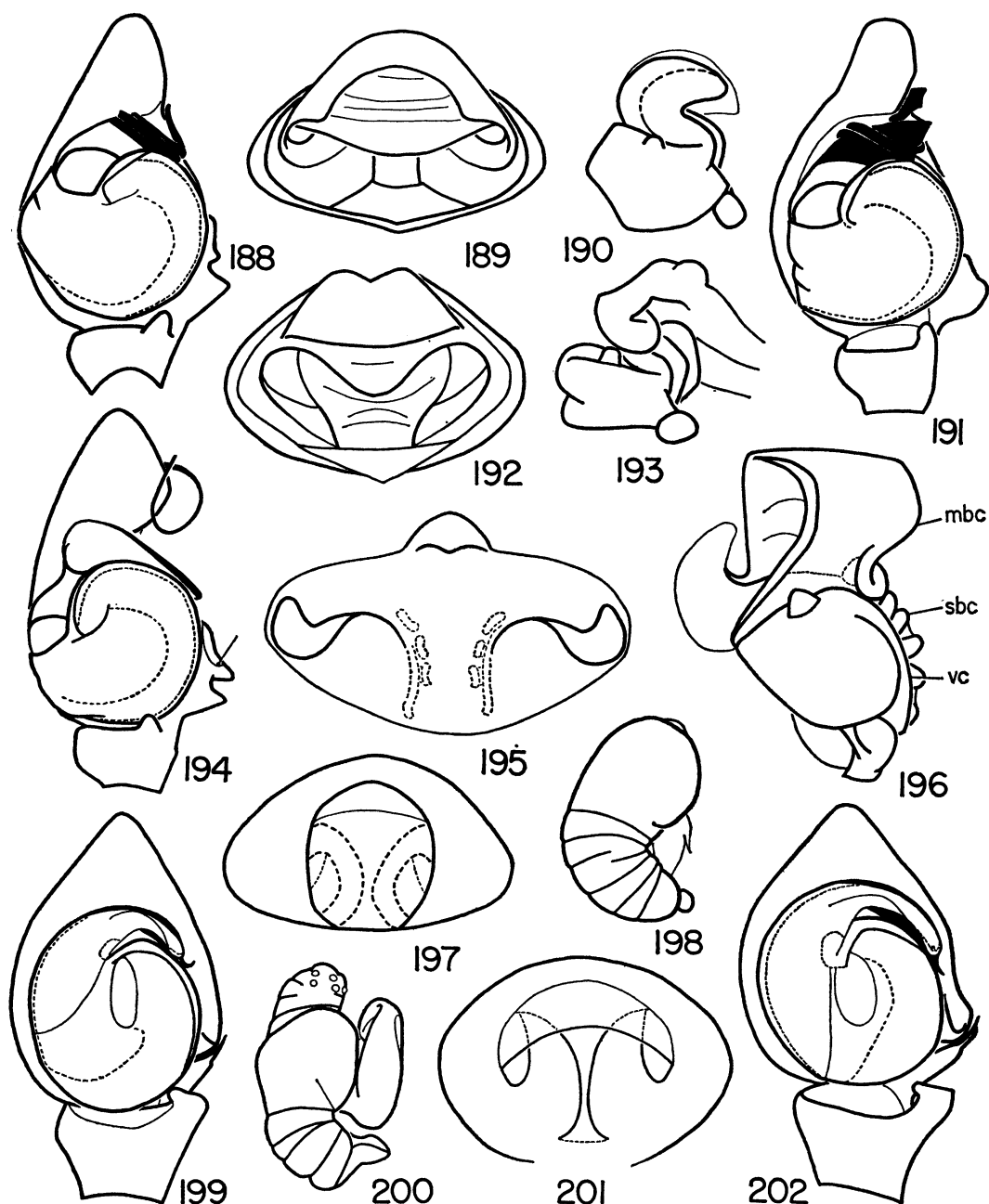
TYPE: Holotype, male, Badger, Tulare County, California, July 1, 1958, D. Verity, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 30).

ECOLOGY: This crab spider has been taken only in chaparral, the great majority of specimens on certain species of manzanita, *Arctostaphylos*. However, *verityi* also occurs on other chaparral flora. In a collection from the



MAP 29. Distribution of *Misumenops aikoe*, new species.



FIGS. 188–190. *Misumenops verityi*, new species. 188. Male palpus, ventral view. 189. Epigynum. 190. Receptaculum, dorsal view.

FIGS. 191–193. *Misumenops dubius* Gertsch. 191. Male palpus, ventral view. 192. Epigynum. 193. Receptaculum, dorsal view.

FIGS. 194–196. *Misumenops coloradensis* Gertsch. 194. Male palpus, ventral view. 195. Epigynum. 196. Receptaculum, dorsal view.

FIGS. 197–199. *Tmarus angulatus* (Walckenaer). 197. Epigynum. 198. Receptaculum, dorsal view. 199. Male palpus, ventral view.

FIGS. 200–202. *Tmarus salai*, new species. 200. Receptaculum, dorsal view. 201. Epigynum. 202. Male palpus, ventral view.

Abbreviations: mbc, membranous bursa copulatrix; sbc, sclerotized bursa copulatrix; vc, ventral canal.



MAP 30. Distributions of *Misumenops verityi*, new species,
M. devius Gertsch, and *M. coloradensis* Gertsch.

Diablo Range, south of Livermore, a specimen was taken on *Adenostoma fasciculatum* Hooker and Arnott, but manzanita was close by. In the Fresh Pond area of El Dorado County, where chaparral elements are somewhat sparsely distributed among species of the Yellow Pine Forest community, most specimens of *verityi* were collected on manzanita, but some were also taken on *Quercus dumosa* Nuttall and *Ceanothus* sp.

SEASONAL DATA: Adult males and females were collected in July. Immature males and females collected in May matured in July.

REMARKS: The epigyna of both *verityi* and *devius* are very variable, but usually the structure of the epigynum is diagnostic. However, occasionally the epigyna of the two are so similar that identification is difficult. In these cases the receptaculum must be used for separation. Such a convergence of epigynal structure is rather interesting, considering the distinctness and structural constancy of the male palpus in both species.

Verityi and *devius* are very similar in facies. Their orange to reddish coloration, often with highly contrasting black markings, is singular for *Misumenops*. Possibly correlated with this coloration is the occurrence of both species almost exclusively on species of manzanita.

Verityi appears to be close to *M. spiralis* F. Pickard-Cambridge, 1900, from Guatemala, judging by the figure of the male palpus in the original description.

***Misumenops (Misumenops) devius* Gertsch**

Misumenops devius GERTSCH, 1939, p. 330, figs. 58, 59.

FEMALE: Average length about 6.5 mm.

Coloration and markings similar to those of *verityi*.

Epigynum (fig. 192): Posterior rim of hood weakly convex; median septum broad, rather bulbous, and transversely grooved; intromittent orifice obscure, situated in large lateral atrium into which sclerotized bursa copulatrix and ventral canal of intromittent division apparently exit separately.

Receptaculum (fig. 193): Intromittent divisions broadly conjoined. Membranous bursae copulatrices not distinguishable, apparently taken into large lateral atria of epigynum; sclerotized bursa copulatrix dark.

MALE: Average length about 4.0 mm.

Coloration and markings similar to those of *verityi*.

Palpus (fig. 191): Truncus very stout, terminating in a tightly wound, apically truncate helix in which the pars pendula is reduced.

TYPES: Holotype, male, allotype, female, from Pomona, California, July, 1934, B. J. Hall, in the American Museum of Natural History. The allotype female is probably not *devius*. The Pomona type locality certainly seems to be spurious, and the following new type locality is here designated: Hurkey Camp, San Jacinto Mountains, Riverside County, California.

DISTRIBUTION: Known only from California (map 30).

ECOLOGY: *Devius* has been collected only in chaparral in which manzanita, *Arctostaphylos*, is an element and primarily occurs on this plant.

SEASONAL DATA: Only two mature specimens have been taken in nature, both males, collected in May and July. Immature males and females taken early in the year molted to maturity from April through June, the majority in June.

***Coloradensis* GROUP**

Male palpus: Basal division of embolus with a prominent dorsal spine accommodated by a deep, retrolateral, cymbial emargination; truncus slender, not apparently twisted; embolus terminating in a double spiral, the basal spiral retrolateral, the apical spiral ventral. Distal tooth of RTA dorsal in position. Receptaculum: Rotated from position typical of genus.

This group is monotypic.

***Misumenops (Misumenops) coloradensis* Gertsch**

Misumenops coloradensis GERTSCH, 1933b, p. 17, fig. 14; 1939, p. 331.

FEMALE: Average length about 5.0 mm.

Allatal stripe distinct or indistinct, green in life, fading to brown in alcohol. Anterior leg bands distinct or indistinct, red or pale brown. Dorsum of abdomen largely pale to dark red, the reds completely fading in alcohol; paramedial maculae present; ventral stripe present or absent.

Epigynum (fig. 195): Guide pocket small; atrium and median septum lacking; intromit-

tent orifices widely spaced, asymmetrically pyriform. Sclerotized bursa copulatrix appearing through integument as a corkscrew-like structure.

Receptaculum (fig. 196): Membranous bursa copulatrix a large, ribbon-like structure; sclerotized bursa copulatrix, a mesial structure, highly convoluted; ventral canal situated at caudal end of spermatheca.

MALE: Length about 2.5 mm.

Allatal stripe grayish, narrow. Abdomen similar in appearance to that of *lepidus*.

Palpus as shown in figure 194.

TYPES: Holotype, male, allotype, female, from Colorado, in the American Museum of Natural History.

DISTRIBUTION: Southwestern United States and northern Mexico (Gertsch, 1939). The distribution in California is indicated in map 30.

GENUS *TMARUS* SIMON

Tmarus SIMON, 1875, p. 259; 1895, p. 994. GERTSCH, 1939, p. 302.

TYPE: *Aranea piger* Walckenaer, 1802.

Clypeus oblique to horizontal, lacking carina; lateral eyes situated on prominent discrete tubercles; ALE larger than AME; carapace setae setiform; seta A1 distinctly shorter than A2, both well developed and erect; X-seta lacking; T5 a principal element of the discal vestiture. Prodorsal spiniforms of femora present; tibiae I, II with prolateral spiniforms, proventroapical spiniform lacking; basitarsi I, II with or without prolateral spiniforms, with three to five proventral spiniforms and one proapical spiniform; legs I and II of male with well-developed spiniforms. Abdomen with characteristic dorsocaudal tubercle. Male palpus: Embolus of generalized type but pendular sclerite present; bulbar apophyses usually lacking; circumtegular ridge present; tegulum with suggestion of basal tegular ridge. Tutacular apophysis well developed. VTA well developed; ITA associated with VTA. Receptaculum: Bursa copulatrix and spermatheca distinctly delimited; tuberculate spermathecal organ present.

This description is based on primarily Californian *Tmarus*.

Tmarus is a large genus of strange-looking spiders; the clypeus is oblique rather than vertical, and the abdomen has a usually

prominent dorsocaudal tubercle. The Californian representatives show similarities to the *Diaea*-misumenoid stock in the absence of the X-seta and the presence of a well-developed T5, and to *Xysticus* in the development of a strong cymbial apophysis and the association of the ITA with the VTA in the male genital bulb.

KEYS TO THE SPECIES OF *Tmarus* IN CALIFORNIA

Males

Embolus, as indicated by termination of reservoir, originating near 180 degrees, apical portion relatively large, spinelike apex only slightly curved (fig. 202) *salai*

Embolus, as indicated by termination of reservoir, originating closer to 225 than to 180 degrees, apical portion smaller, spinelike apex more strongly curved (fig. 199). *angulatus*

Females

Slitlike intromittent orifices not reaching cephalad to level of hood (fig. 197). Setae P1 parallel, T5 distinctly shorter than PME interdistance *angulatus*

Slitlike intromittent orifices extending cephalad to beneath hood (fig. 201). Setae P1 usually divergent, T5 subequal to or longer than PME interdistance *salai*

Tmarus angulatus (Walckenaer)

Thomisus angulatus WALCKENAER, 1837, p. 537. SIMON, 1895, p. 993. GERTSCH, 1939, p. 305. CHAMBERLIN AND IVIE, 1944, p. 167.

Tmarus magniceps KEYSERLING, 1880, pp. 156-158, pl. 3, fig. 85. Synonymy with *angulatus* by Gertsch, 1939.

FEMALE: Average length 5.5-6.0 mm.

Body typically moderately dark gray. Carapace with several narrow, pale, but sharply defined stripes; areas between stripes orange, with mammillate sculpturing; metadiscus not delimited as a discrete area; setae P1 parallel, A1 directed dorsad, T5 markedly shorter than PME interdistance. Dorsum of abdomen with three pairs of dorsolateral bands (each subdivided transversely into an anterior black and a posterior white band), the anterior pair often obscure and frequently the entire pattern obliterated; setae arising from round pale orange plaques; ventral stripe present, attenuate near spinnerets.

Epigynum (fig. 197): Structure obscure owing to lack of pigmentation. Hood indistinct

owing to transparency; atrium medial and shallow; slitlike intromittent orifice not reaching level of posterior margin of hood.

Receptaculum (fig. 198): Bursa copulatrix not prominent, proximal portion (visible dorsally) two to three times as long as broad; spermatheca with a broader unsegmented anterior portion, bearing a flat anterior tubercle, and a somewhat curved and narrower posterior "segmented" portion.

MALE: Average length 4.5–5.0 mm.

Palpus (fig. 199): Embolus originating near 225 degrees, terminating in a ventrally directed, hook-shaped spine, less elongate, more strongly curved, and pendular sclerite smaller than that of *salai*.

TYPES: Type based on unpublished Abbott drawing number 237; holotype cited by Chamberlin and Ivie (1944) as "?♀." Holotype male of *magniceps* from Mariposa, California, in Museum National d'Histoire Naturelle, Paris, Simon collection (Gertsch, 1939).

DISTRIBUTION: The United States (Gertsch, 1939). The distribution in California is shown in map 31.

SEASONAL DATA: Mature males have been taken from February through July and females from April through September, the latter most commonly from April through June. In the Sierra Nevada and in northern California adults are found usually not earlier than May.

Tmarus salai, new species

FEMALE: Average length 5.5–6.0 mm.

Markings, coloration, and chaetotaxy similar to those of *angulatus*, but carapace setae longer and more slender, setae P1 usually divergent, T5 subequal to longer than PME interdistance, and anterior pair of abdominal bands invariably developed.

Epigynum (fig. 201): Hood transparent but more discernible than that of *angulatus*; slitlike intromittent orifice obscure, elongate, extending posteriad to beneath hood.

Receptaculum (fig. 200): Bursa copulatrix longer than that of *angulatus*, that part visible from dorsal view three to four times longer than broad; spermatheca very similar to that of *angulatus* except anterior unsegmented portion with a very large segmented process bearing small flat tubercles (cf. fig. 198).

MALE: Length 4.75 mm.

Markings, coloration, and chaetotaxy like those of *angulatus*.

Palpus (fig. 202, a male from Banner, San Diego County): Differing from *angulatus* in the following respects: embolus originating near 180 degrees, embolus more elongate, pendular sclerite larger than, and terminal spine not so strongly hooked as, those of *angulatus* (cf. fig. 199).

TYPE: Holotype, female, Banner, 3 miles east, San Diego County, California, June, 1958, D. Verity, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 31).

SEASONAL DATA: Adults have been taken in May and June. A penultimate male collected in April matured in that month. An immature female, taken in September, underwent a winter-spring diapause and matured in May.

GENUS *XYSTICUS* C. L. KOCH

Xysticus C. L. KOCH, 1835, pp. 16–17. SIMON, 1895, p. 1935; 1932, p. 812. GERTSCH, 1939, p. 349; 1953, p. 420.

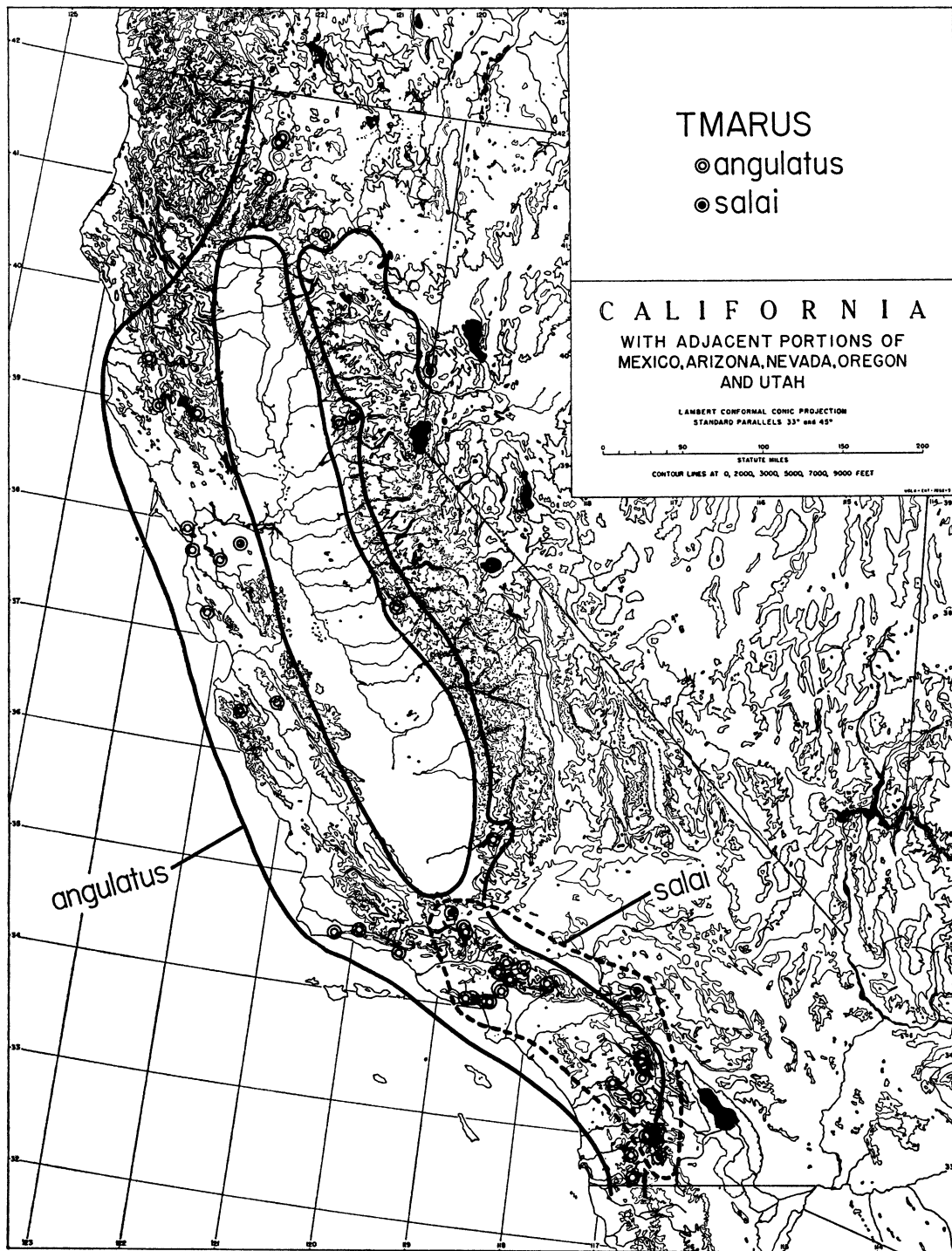
Spiracme MENGE, 1875, p. 447. Synonymy with *Xysticus* by Simon, 1895.

Psammitis MENGE, 1875, p. 448. DALMAS, 1922, p. 91. Synonymy with *Xysticus* by Simon, 1895.

Proxysticus DALMAS, 1922, pp. 79–96. Synonymy with *Xysticus* by Simon, 1932.

TYPES: Of *Xysticus*, *Aranea audax* Schrank, 1803. Of *Spiracme*, *Xysticus striatipes* L. Koch, 1870. Of *Psammitis*, *Thomisus sabulosus* Hahn, 1831. Of *Proxysticus*, *Thomisus lalandei* Savigny, 1825.

Clypeus vertical, acarinate; lateral eyes situated on discrete tubercles; ALE larger than AME; carapace setae blunt to clavate; setae A1 and A2 well developed, subequal in length; T5 weak or not distinguishable; X-seta present. Femora with prodorsal spiniforms; tibia I, II of male typically with three prolateral spiniforms (usually lacking in female); a proventroapical spiniform present in both sexes; basitarsi I, II with one or two prolateral, three to five proventral, and two propal, spiniforms; legs I and II of male typically with well-developed spiniforms. Male palpus: Tegulum often with bulbar apophyses; basal tegular ridge present, circumtegu-



MAP 31. Distributions of *Tmarus angulatus* (Walckenaer) and *T. salai*, new species.

lar ridge absent. Tutacular apophysis well developed, tutacular groove usually extending into apophysis as a deep channel. VTA well developed; ITA usually apparent and usually conjoined with VTA. Receptaculum: Intromittent division and spermatheca usually not distinctly delimited from each other; spermathecal organ not apparent or developed as usually small, domelike tubercles. Abdominal markings: Dorsum of abdomen with a serrated midsagittal stripe; serrations not usually well developed in anterior portion, extending to dorsolateral edge of abdomen, each bordered posteriorly by a narrow black band; lateral areas between serrations appearing as large maculae.

THE MALE PALPUS

The male palpus of *Xysticus* shows a broad range of variation in the tibial apophyses, tutacular apophysis, and the various apophyses of the tegulum. These variations are discussed below (see p. 143 for a list of the supraspecific taxa mentioned). The palpus of *Coriarachne* is included in the discussion here, since it is similar to that of *Xysticus*.

THE TIBIAL APOPHYSES: The VTA and the ITA are particularly variable, the former by its various elaborations and the latter by its size and degree of association with the VTA.

Ventral tibial apophysis (VTA): In *Pellysticus*, *Lassysticus*, and primitive forms of the subgenus *Xysticus* (e.g., the Palearctic *cristatus*) there are two types of elaborations of the VTA: (1) an apical division, an apically flattened lobe which ventrally appears to be placed obliquely, flat side down, upon the VTA and, in its most perfect form, appears retrolaterally as a rounded apophysis projecting from the apical margin of the tibia; and (2) a basal lobe, produced from the retrolateral side of the VTA. In other species of *Xysticus* there is usually some suggestion of an apical division but no other elaborations (although the appearance of the VTA may be quite altered by fusion of the ITA).

Intermediate tibial apophysis (ITA): In the present treatment of *Xysticus* an ITA is considered absent in *Pellysticus* and *Lassysticus*, which implies that neither the apical division nor basal lobe of the VTA of these two subgenera is homologous to the structure termed the ITA in the other groups of the

genus. This inference is based on the condition in *Xysticus cristatus* of the subgenus *Xysticus* in which a small independent ITA is present in addition to the apical division and basal lobe.

The ITA in the subgenus *Xysticus* may be: (1) developed as a small independent apophysis between the VTA and the RTA (*audax* and *ferox* series, in some instances greatly reduced in the latter), or (2) well developed and broadly joined to the VTA, only a slight emargination separating the two (*cunctator* series). In *Proxysticus*, *Psammitis*, and *Coriarachne* the ITA is associated with the VTA and may be: (1) apically separated from the VTA by an emargination which is often deep (*lalandei*, *montanensis*, and *labradorensis* series), (2) reduced, forming a small dorsal lobe (*sabulosus* series, *Coriarachne*), or (3) apparently not developed (*triangulosus* series).

Gertsch (1939) terms the apophysis between the VTA and RTA in the *concurus* and *lalandei* series an "intermediate apophysis," but this structure does not seem to be homologous in these two groups. However, one cannot be dogmatic in the homologies of apophyseal outgrowths between the VTA and RTA in different groups.

THE TUTACULAR APOPHYSES: There appear to be four basic types of tutacular apophyses developed in the genus *Xysticus*, described as follows mainly from selected types: (1) *Locuples* type (fig. 10), characteristic of the subgenus *Pellysticus*. The venter of the apophysis is sharply inclined as it extends out broadly from the cymbial alveolus, and the ridge, formed by the inclination, is prominent, juxtaposed against the margin of the bulb. The tutacular groove is typically narrow and deep and its mesial wall sclerotized. In *Xysticus peltax*, *X. gulosus*, and *X. lutzi* the groove is very broad. The tutacular apophysis of *Xysticus (Proxysticus) durus* is also apparently of the *locuples* type. (2) *Californicus* type (fig. 11), characteristic of the subgenus *Xysticus*. The apophysis is formed by a narrower extension of the alveolar sclerite than above and is produced as an elongate, ventrally directed, scooplike structure. The tutacular groove; broad and deep, accommodates the bulky terminal portion of the embolus, and its mesial wall is usually wholly membranous. (3) *Montanensis* type (fig. 12),

characteristic of *Proxysticus*. This type is similar to *locuples*, but it projects wedge-shaped from the alveolus and its ventral surface lacks the basal ridge formed by a sharp inclination. The tutacular groove is narrow, not so deep as in the *locuples* type, and its mesial wall is weakly sclerotized. (4) *Utahensis* type (fig. 13), characteristic of *Psammitis* and *Coriarachne*. The tutacular apophysis is elongate, narrow in its basal portion but broadening distad. The tutacular groove is shallow, wholly ventral in position, and does not extend into the tutacular apophysis. In species with a straight embolus the groove is narrow, and in those with a spiral embolus it is broad.

THE BULBAR APOPHYSES: An apophysis of the tegulum which is strongly produced and sclerotized, or a structure possibly derived from such an apophysis, is termed a "bulbar apophysis" here. An apical bulbar apophysis (ABA), associated with the apical margin of the tegulum (=the distal apophysis of Gertsch [1939]), is present in most subgenera of *Xysticus*. A medial bulbar apophysis (MBA), situated near the center of the tegulum, is present only in the apophysate subgenera. The ABA and MBA of the *pellax* series of the subgenus *Pellysticus* (fig. 4) may be regarded as primary bulbar apophyses. Apparent homologues of both these apophyses are present in the *concursum* series of *Pellysticus* and in Old World species of the subgenus *Xysticus* (*X. audax* and related species). In at least three instances in the apophysate *Xysticus* a secondary ABA appears to be represented: (1) In *X. audax* and related species, in addition to both primary apophyses, the apicotegular process (see below) is developed as a bulbar apophysis. In the New World species of this subgenus the primary ABA is apparently suppressed, but the apicotegular process persists as a strong, secondary ABA. (2) In the *Xysticus* (*Pellysticus*) *concursum* series a large prolaterally and ventrally produced secondary ABA is developed in addition to the smaller primary apophyses. (3) The ABA of *Lassysticus*, a recumbent fold of integument the walls of which are nearly appressed. The form of this apophysis suggests a derivation from a condition similar to that in the *concursum* series in which the secondary ABA has become flat-

tened against the surface of the tegulum (compare figs. 220 and 224).

In the "anapophysate" *Proxysticus*, *Psammitis*, and *Coriarachne* strong bulbar apophyses are generally lacking, but an apical portion of the tegulum may be produced as an ABA, a low and narrow or shelflike ridge. In some species (e.g., *montanensis*) there is a small sclerite associated with the apical side of the low narrow ridge. This type of structure could be derived from a condition similar to that in the *concursum* series or in *Lassysticus*, in which the ABA has become further appressed against the surface of the tegulum and the apicotegular process sandwiched between (compare figs. 224 and 239). The small sclerite associated with the apical margin of the apophysis would then correspond to the apicotegular process.

APICOTEGULAR PROCESS: Developed in most species of *Xysticus* is a highly variable structure, which may be termed the "apicotegular process," arising from the apical margin of the tegulum. In Californian species the process may be: (1) a pale, flaplike, median area, usually marginally sclerotized and associated with the ABA (*Pellysticus*, *Lassysticus*) or (2) a large and heavily sclerotized secondary ABA (subgenus *Xysticus*).

THE DISTAL CRESCENT: This is a pale, distal part of the tegulum developed distad of the basal portion of the reservoir in many species of *Pellysticus* (fig. 4).

CLASSIFICATION OF *Xysticus*

The *Xysticus* of arachnologists before 1870 comprised the *Xysticus* and *Coriarachne* of modern authors. Thorell (1870) separated *Coriarachne* from *Xysticus* on the basis of the flattened body condition of the former.

Menge (1875) divided the *Xysticus* of Thorell into *Xysticus*, *Spiracme*, and *Psammitis*, the last two as new. Apparently the main criterion for establishing the new genera was the absence of bulbar apophyses on the male palpus. Menge, evidently struck by the "screw-like" embolus of *Xysticus striatipes* L. Koch (= *Spiracme striata* Menge), separated this species, as the genus *Spiracme*, from the other anapophysate forms, which comprised the genus *Psammitis*, as represented by *sabulosus* Hahn. The recognition of an apophysate and an anapophysate group in

Xysticus, *sensu lato*, appears to be a proper phyletic interpretation, but the peculiar type of embolus of *X. striatipes* probably should not be considered as a character of such high group significance. Simon (1895) did not consider the anapophysate condition of generic caliber and synonymized *Spiracme* and *Psammitis* with *Xysticus*. The genus was not further analyzed taxonomically by Simon in that paper.

Dalmas (1922) recognized three groups in *Xysticus* which were treated as separate genera, *Xysticus*, *Psammitis* Menge, and *Proxysticus*, a new genus. The *Xysticus* was equivalent to that of Menge, i.e., comprising the apophysate *Xysticus*. *Proxysticus* was characterized principally by the shelllike prominence on the genital bulb and *Psammitis* by the type of embolus (the apical embolar sclerite of the present paper) and type of tutaculum (the *utahensis* type of the present paper). The *Proxysticus* of Dalmas corresponds to the *Xysticus* (*Proxysticus*) *lalandei* series, and the *Psammitis* of Dalmas to the subgenus *Psammitis*, of the present paper. Dalmas showed considerable insight in defining the latter group.

Simon (1932) recognized four taxonomic groups in *Xysticus*. The first, the *cristatus* group, and the second, the *longipes* group, comprised the apophysate *Xysticus* of Menge and Dalmas and were also distinguished from the anapophysate *Xysticus* by the presence of six spiniforms in the frontal row (as opposed to eight in the anapophysate *Xysticus*). The *longipes* group was contrasted to the *cristatus* group by differences in the bulbar apophyses (a characteristic type of secondary ABA is present in the former group) and in the absence of a tutaculum (a questionable criterion since a well-developed tutaculum is indicated by Simon in his illustration of the *longipes* palpus). Simon considered his third group (the *sabulosus* group) synonymous with the *Psammitis* of Dalmas and his fourth group (the *robustus* group) synonymous with *Proxysticus*. The important embolar and tutacular characters of Dalmas were unfortunately not recognized, and consequently species were included in the *sabulosus* group that properly belong in the *robustus* group.

Gertsch (1939) recognized five groups in Nearctic *Xysticus*: the *viaticus* (= *cristatus*),

cunctator, *concurus*, *sabulosus*, and *robustus* groups. The first two groups are subdivisions of the *cristatus* group of Simon, the *cunctator* group distinguished from the *viaticus* group by the presence of a pendular sclerite and by characteristics of the bulbar apophyses. This was a fundamental advance in the classification of the genus. The *concurus* group, as Gertsch noted, is closely related to the *longipes* group of Simon but differs from the latter in the presence of an "intermediate apophysis" on the tibia of the male palpus (but not in the tutacular character mentioned by Gertsch). Probably these two groups should be regarded as one. The anapophysate groups of Gertsch, *sabulosus* and *robustus*, correspond to those of Simon.

Gertsch, in his 1953 revision, subdivided *Xysticus* into two subgenera, the subgenus *Xysticus*, comprising the apophysate species, and the subgenus *Spiracme* Menge, the anapophysate species. The *viaticus*, *cunctator*, and *concurus* groups are treated as subdivisions of the former subgenus; the *sabulosus*, *durus*, and monotypic *aztecus* groups, as subdivisions of *Spiracme*. The *durus* group corresponds to the *robustus* group of Simon. *Xysticus aztecus* Gertsch was described in that paper and appears to be a highly aberrant form.

The recategorization of the various xysticoid groups is based principally on the recognition of the different types of tutaculi and emboli and on the homologizing of the different bulbar apophyses.

The five subgenera recognized here are characterized in table 6 on the basis of the male palpus.

KEYS TO THE SPECIES OF *Xysticus* IN CALIFORNIA¹

Males

1. MBA present 2
MBA absent 14
- 2(1). MBA T-shaped, ABA a broad, flattened, acute process (fig. 224; subgenus *Lassysticus*) *lassanus*
MBA and ABA not as above 3
- 3(2). Pars pendula broad at base, tapering apicad, terminating well basad of tip of

¹ The species *cunctator* Thorell, 1877, which has not been recorded from California, is included for comparison with *californicus*.

TABLE 5

CLASSIFICATION OF *Xysticus* OF THE PRESENT PAPER CONTRASTED TO THAT OF GERTSCH (1953)(The Nearctic but non-Californian *X. variabilis* Keyserling, *X. verecundus* Gertsch, and *X. aztecus* are not included.)

Present Taxa	Taxa of Gertsch (1953)
Apophysate division (<i>Pellysticus</i>), new subgenus	(<i>Xysticus</i>)
<i>pellax</i> series	(<i>Xysticus</i>) <i>viaticus</i> group, excluding <i>lassanus</i> Chamberlin, including <i>lutzi</i> Gertsch
<i>concurus</i> series	(<i>Xysticus</i>) <i>concurus</i> group, excluding <i>lutzi</i> Gertsch
(<i>Xysticus</i>) C. Koch	(<i>Xysticus</i>) <i>cunctator</i> group
<i>audax</i> series ^a	
<i>ferox</i> series ^a	
<i>cunctator</i> series	
(<i>Lassysticus</i>), new subgenus	(<i>Xysticus</i>) <i>viaticus</i> group, in part
Anapophysate division	(<i>Spiracme</i>)
(<i>Proxysticus</i>) Dalmas	
<i>lalandei</i> series ^a	(<i>Spiracme</i>) <i>durus</i> group
<i>montanensis</i> series	(<i>Spiracme</i>) <i>sabulosus</i> group, in part, including <i>Synema bicolor</i> and <i>S. obscura</i> Keys
<i>triangulosus</i> series ^a	(<i>Spiracme</i>) <i>sabulosus</i> group, in part
(<i>Psammitis</i>) Menge	
<i>sabulosus</i> series	(<i>Spiracme</i>) <i>sabulosus</i> group, in part
<i>labradorensis</i> series ^a	(<i>Spiracme</i>) <i>sabulosus</i> group, in part

^a Not indigenous to California.

TABLE 6

COMPARISON OF THE MALE PALPUS OF THE SUBGENERA OF NEARCTIC *Xysticus* AND THE GENUS *Coriarachne*

	Embolus	MBA	Primary ABA	Secondary ABA	Tutacular Apophysis
<i>Pellysticus</i>	Generalized type	Present	Present	Present in <i>concurus</i> series only	<i>Locuples</i> type
<i>Xysticus</i>	With a pendular sclerite	Present, may be reduced	Absent	Present	<i>Californicus</i> type
<i>Lassysticus</i>	Generalized type	Present	Absent	Present	<i>Locuples</i> type, reduced ^a
<i>Proxysticus</i>	Generalized type	Absent	Absent	Reduced	<i>Montanensis</i> type
<i>Psammitis</i>	With an apical embolar sclerite	Absent	Absent	Absent	<i>Utahensis</i> type
<i>Coriarachne</i>	With an apical embolar sclerite	Absent	Absent	Absent	<i>Utahensis</i> type

^a Uncertain homology.

- truncus, without a pendular sclerite; tutacular apophysis of *locuples* type (as in figs. 4, 10); VTA with prominent apical division (as in fig. 4; subgenus *Pellysticus*) 4
- Pars pendula broadly developed along nearly entire length of truncus, pendular sclerite developed on a mesoapical fold; tutacular apophysis of *californicus* type (as in figs. 11, 227); VTA without a distinct apical division (as in fig. 227; subgenus *Xysticus*) 12
- 4(3). Secondary ABA present, a broad structure developed prolaterad of primary apophyses; tibia strongly produced between VTA and RTA (figs. 217, 220; *concurus* series) 5
- Secondary ABA not present; tibia not produced between VTA and RTA (*pellax* series) 6
- 5(4). Apicotegular process with a distal fold; area between VTA and RTA produced into a discrete rounded lobe bearing curved setae (fig. 220) . . . *coloradensis*
- Apicotegular process without a fold; retrolateral area of tibia not so produced, bearing short, stout spiniforms (fig. 217) *aprilinus*
- 6(4). MBA reduced, ABA much larger, somewhat scooplike (fig. 216; *lutzi* group) *lutzi*
- MBA well developed and hook-shaped, smaller or subequal in size to ABA; ABA usually conical 7
- 7(6). ABA markedly smaller than MBA (fig. 213; *pretiosus* group) *pretiosus*
- ABA subequal to or only slightly smaller than MBA 8
- 8(7). Pars pendula terminating on truncus near 270 degrees of tegulum; distal margin of tegulum straight (fig. 203; *pellax* group) *gulosus*
- Pars pendula terminating on truncus near 0 degrees of tegulum or farther apically; distal margin of tegulum convex (*locuples* group) 9
- 9(8). Tutacular apophysis projecting beyond proximal margin of tegulum (figs. 206, 209). Primary setae of mesodiscus and metadiscus only subequal in length to ALE diameter (*locuples* subgroup) . 10
- Tutacular apophysis not projecting beyond proximal margin of tegulum (figs. 210, 212). Primary setae of mesodiscus and metadiscus long, subequal to, to longer than, PME interdistance (*gosiutus* subgroup) 11
- 10(9). ABA not hook-shaped or acuate (fig. 209). Seta S3 and caudoallatal setae not spiniform, the latter only subequal in length to PME diameter; allatal stripes diverging at level of and caudal to metadiscus *apachecus*
- ABA hook-shaped and acuate (fig. 206). Seta S3 and caudoallatal setae spiniform, the latter longer than PME diameter; allatal stripes converging caudal to metadiscus *locuples*
- 11(9). Embolus originating near 180 degrees; distal crescent present; ABA originating directly proximal to MBA (fig. 210) *gosiutus*
- Embolus originating near 270 degrees; distal crescent absent; ABA originating distinctly prolateral to MBA (fig. 212) *chaparralis*
- 12(3). Dorsal apophysis (da) of pendular sclerite long and slender, extending dorsad to level of truncus, truncus terminating as a rounded lobe (fig. 228) . . . *gertschi*
- Dorsal apophysis (da) of apical pendular sclerite short, a wedge-shaped or a rounded toothed lobe not reaching level of truncus; truncus hooklike terminally (fig. 233) 13
- 13(12). Pars pendula between apical sclerite and truncus with several sclerotized ridges (fig. 233); dorsal apophysis of apical sclerite difficult to discern owing to dark background provided by ridges of pars pendula; distal hook of truncus proportionately longer *californicus*
- Pars pendula between apical sclerite and truncus lacking sclerotized ridges; dorsal apophysis of apical sclerite easily discernible *cunctator*
- 14(1). Tutacular apophysis *utahensis* type (as in fig. 13); VTA without a retrolateral division, or with only a small retrolateral lobe (ITA) and no distinct apical emargination (as in fig. 247); RTA not reaching tutacular apophysis (subgenus *Psammitis*) *knowltoni*
- Tutacular apophysis of *montanensis* type (as in fig. 12); VTA with a broad, retrolateral division (ITA), a distinct apical emargination separating the two (as in figs. 239, 245); RTA extending distad to or beyond tutacular apophysis (subgenus *Proxysticus*) 15
- 15(14). Truncus reaching tip of tutacular groove; mesial margin of pars pendula not sclerotized (*montanensis* group) . 16
- Truncus shorter, not reaching tip of

- tutacular groove; mesial margin of pars pendula sclerotized (*luctuosus* group) . . . 19
- 16(15). Tegulum with a transverse ridge (fig. 235) . . . *punctatus*
Tegulum with an oblique or longitudinal ridge (figs. 238, ABA, 239) . . . 17
- 17(16). Embolus originating near 270 degrees; ridge of tegulum separated from periphery of tegulum usually by a distance of slightly less than length of ridge (fig. 239) . . . *montanensis*
Embolus originating near 180 degrees; ridge of tegulum extending to near periphery of tegulum (fig. 238, ABA) . . . 18
- 18(17). Length of tegulum 0.56–0.57 mm. (three specimens). San Diegan District . . . *iviei iviei*
Length of tegulum 0.42–0.50 mm. (three specimens). Sierran District . . . *iviei sierrensis*
- 19(15). Embolus originating at about 315 degrees; telgulum with a transverse ridge situated near its center (fig. 244) . . . *pearcei*
Embolus originating near 0 degree; tegulum with an oblique ridge situated near its distal end (fig. 245) . . . *benefactor*

Females¹

1. Epigynum rimmed by a pair of bilateral sclerites (rim sclerites) converging at posterior margin of epigynum, median septum posterior, low, flat, and membranous, extending caudad between rim sclerites (as in fig. 241; subgenus *Proxysticus*) . . . 2
Epigynum without rim sclerites; median septum, when present, not limited to posterior portion of epigynum . . . 5
- 2(1). Secondary setal vestiture of clypeus and discus prominent; seta P2 spiniform; T2 appearing "multiple"; T1 distinctly closer to X-seta than to S1 . . . 3
Secondary setal vestiture of disc not prominent; seta P2 not developed as a spiniform; T2 discrete, single; T1 about equidistant between S1 and X-seta . . . 4
- 3(2). Bursa copulatrix with one or two convolutions, distal arm of proximal convolution (pc) about twice as long as wide (fig. 242; requires dissection) . . . *montanensis*
Bursa copulatrix with three convolutions, distal arm of proximal convolution (pc) longer than one-half of length of spermatheca (fig. 240; requires dissection) . . . *iviei iviei*
- 4(2). Body with orange tint; dorsum of abdomen with a distinct, median, white stripe. Rim sclerites and median septum narrow (fig. 236) . . . *punctatus*
Body dark brown or gray; dorsum of abdomen lacking conspicuous stripe. Rim sclerite and median septum broad (fig. 246) . . . *benefactor*
- 5(1). Median septum produced laterally as a distinct sclerotized tubercle (figs. 204, 207, 214, tms); lateral atria deep and distinct . . . 6
Median septum when present not so produced; lateral atria distinct or not . . . 9
- 6(5). Lateral tubercles of median septum suborbicular, closely approximated, separated by a distance less than one-half of their width (fig. 204, tms) . . . *gulosus*
Lateral tubercles of median septum elongate and narrow, separated by a distance greater than their width (fig. 207, tms) . . . 7
- 7(6). Allatal stripe greenish; seta S5 shorter than one-half of length of S6; primary metadiscal setae subequal to longer than PME interdistance . . . *gosiutus*
Allatal stripe reddish, brown, or gray; seta S5 longer than one-half of length of S6; primary metadiscal setae shorter than PME interdistance . . . 8
- 8(7). Allatal stripes divergent caudad of metadiscus; seta P1 and caudoallatal setae barely longer than ALE diameter. Tibia I often with row of prolateral spiniforms . . . *apachecus*
Allatal stripes convergent caudad of metadiscus; seta P1 and caudoallatal setae markedly longer than ALE diameter. Tibia I without row of prolateral spiniforms . . . *locuples*
- 9(5). Median septum present, raised at least as high as rim of epigynum . . . 10
Median septum, when present, sunk into epigynum below the rim of latter . . . 11
- 10(9). Median septum broadening caudad (fig. 225) . . . *lulizi*
Median septum narrowing caudad (fig. 248) . . . *knowltoni*
- 11(9). Epigynum with distinct median septum, lateral atria present, extending anteriad

¹ The females of *chaparralis*, *iviei sierrensis*, and *pearcei* are unknown.

- to beneath anterior margin of epigynum (figs. 230, 231)12
 Epigynum usually without distinct median septum, lateral atria, when developed (fig. 221), extending anteriorly to beneath lateral margin of epigynum13
 12(11). Carapace setae dark. Median septum of epigynum convex, intromittent orifice distinct, elongate, and slitlike (fig. 231)*californicus*
 Carapace setae pale. Median septum of epigynum flat, intromittent orifice obscure, situated beneath small, membranous flap (fig. 230)*gertschi*
 13(11). Median septum and lateral atria distinct (fig. 221)*coloradensis*
 Median septum and lateral atria not distinct14
 14(13). Allatum with a mesial brown stripe and lateral white stripe; carapace setae pale. Epigynum as shown in figure 218*aprilinus*
 Allatum entirely dark gray; carapace setae dark. Epigynum almost featureless except for tubercles of obscure median septum (fig. 214)*pretiosus*

SUBGENUS PELLYSTICUS, NEW SUBGENUS

TYPE: *Xysticus pallax* O. Pickard-Cambridge, 1894.

Frontal row usually comprising four, rarely three, principal spiniforms on each side. Male palpus: Embolus of generalized type; distal crescent typically well developed; MBA and primary ABA present; secondary ABA usually not developed; apicotegular process a partially or wholly membranous fold. Tutacular apophysis of *locuples* type. VTA with an apical division and basal lobe; distal tooth of RTA small; ITA not present. Receptaculum: Spermatheca without transverse seams.

Pellysticus can be divided into two series: *pallax* and *concursum*.

Pallax SERIES

Frontal row with four principal spiniforms on each side, rarely three. Male palpus: Bulbar apophyses variable in shape but in Californian species usually hook-shaped; MBA with a small, basal, prolateral tooth; secondary ABA not present. Tibia without a prominent produced area between VTA and RTA. Epigynum: Face of epigynum parallel to venter of abdomen.

The *pallax* series includes the typical spe-

cies of *Pellysticus*. The Californian segment comprises four groups: *pallax*, *locuples*, *pretiosus*, and *lutzi*.

Derivation of *pretiosus* from the *locuples* group seems probable. *Xysticus chaparralis* of the *locuples* group is suggestive of an intermediate stage between *pretiosus* and *locuples* (compare figs. 210, 212, and 213). Apparently correlated with the apical extension of the tegulum in *chaparralis* and *pretiosus* are the more apical position of the ABA, the loss of the distal crescent, and the reduction of the apicotegular process.

Pallax GROUP

Male palpus: Embolus long and slender, originating near 135 degrees, broadly curving ventrad in apical portion; pars pendula terminating near 315 degrees of tegulum; tutacular groove very broad. Distal tooth of RTA not visible ventrally. Distal crescent well developed, ectal margin straight; both primary bulbar apophyses well developed, hook-shaped, subequal in size, relatively smaller and situated farther from proximal margin of bulb than in typical members of *locuples* group; basal tooth of MBA minute or not developed; apicotegular process well developed. Epigynum: Median septum and lateral atria distinct, lateral tubercles of septum orbicular to suborbicular and closely approximated, separated by a distance less than one-half of their width. Receptaculum: Bursa copulatrix and spermatheca not clearly delimited from each other, receptaculum similar in diameter throughout its length, proximally with three or four broadly looped convolutions (probable intromittent portion) and distally terminating as a transverse tube bearing prominent tubercles of spermathecal organ along anterior side.

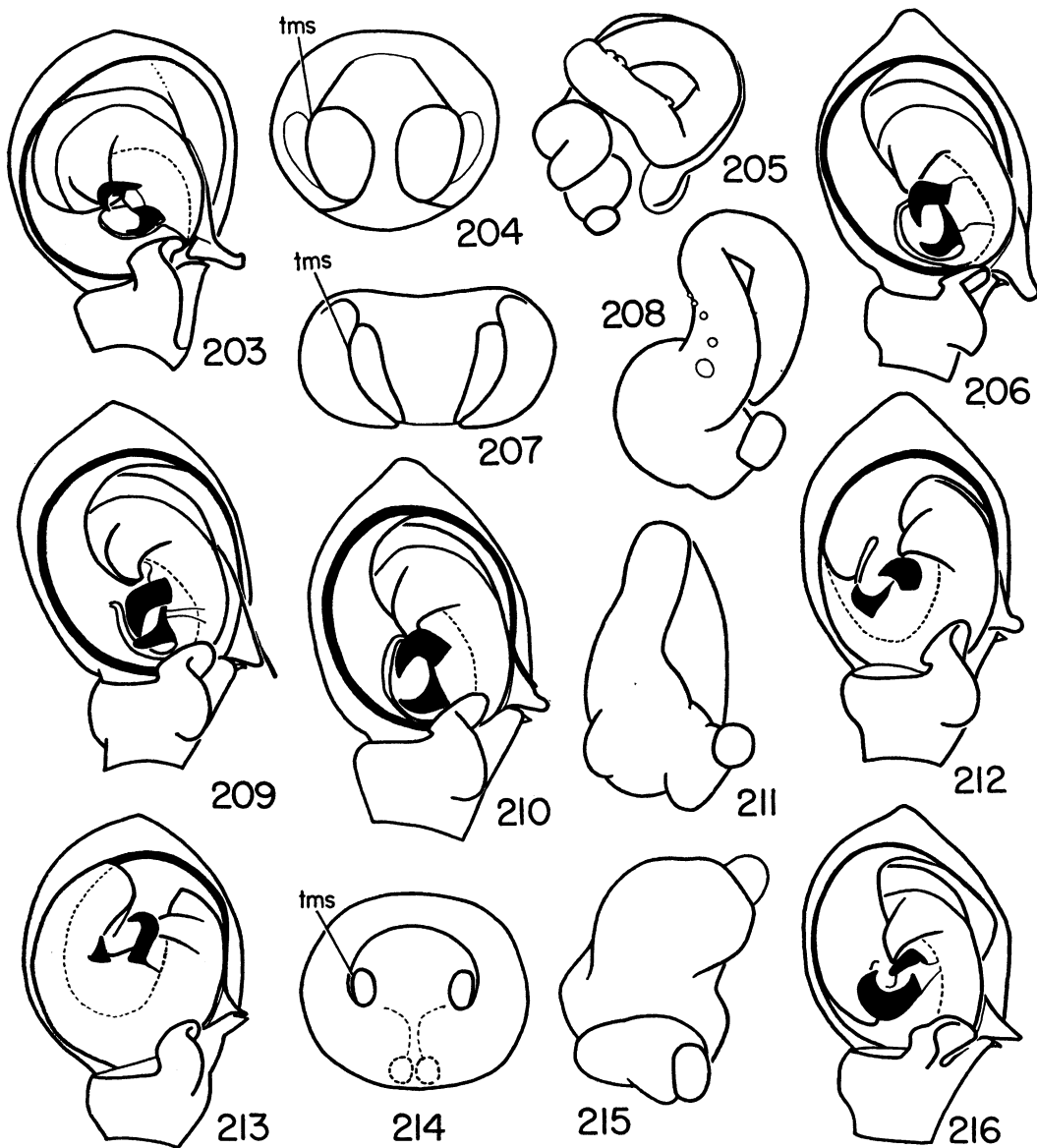
Xysticus (*Pellysticus*) *gulosus* Keyserling

Xysticus gulosus KEYSERLING, 1880, pp. 43-45, pl. 1, fig. 21. GERTSCH, 1939, p. 353.

Xysticus (*Xysticus*) *gulosus*: GERTSCH, 1953, p. 422.

FEMALE: Average length about 7.5 mm.

Allatal stripes convergent caudal to metadiscus; primary carapace setae pale and stout, distinctly shorter than PME interdistance, most only subequal to ALE diameter; seta P2 curved and directed laterad; S5 short, sub-



FIGS. 203–205. *Xysticus gulosus* Keyserling. 203. Male palpus, ventral view. 204. Epigynum. 205. Receptaculum, dorsal view.

FIGS. 206–208. *Xysticus locuples* Keyserling. 206. Male palpus, ventral view. 207. Epigynum. 208. Receptaculum, dorsal view.

FIG. 209. *Xysticus apachecus* Gertsch, male palpus, ventral view.

FIGS. 210, 211. *Xysticus gosiutus* Gertsch. 210. Male palpus, ventral view. 211. Receptaculum, dorsal view.

FIG. 212. *Xysticus chaparralis*, new species, male palpus, ventral view.

FIGS. 213–215. *Xysticus pretiosus* Gertsch. 213. Male palpus, ventral view. 214. Epigynum. 215. Receptaculum, dorsal view.

FIG. 216. *Xysticus lutzii* Gertsch, male palpus, ventral view.

Abbreviation: tms, tubercle of median septum.

spiniform, and much weaker than S6; T2, T3, and T4 distinct from secondary setal vestiture. Tibia I typically 0-2-1 or 0-3-1; basitarsus I, 1-4-2.

Epigynum (fig. 204): Lateral tubercle of median septum suborbicular.

Receptaculum as shown in figure 205.

MALE: Average length about 4.5 mm.

Allatal stripes convergent caudal to metadiscus; primary discal setae rather pale and stout, characteristic in appearance, broad at the base, sides straight and tapering evenly to a point. Californian specimens: primary discal setae moderate in length, from distinctly longer than ALE diameter to subequal to PME interdistance; seta P2 directed laterad; T2, T3, and T4 discrete from secondary setal vestiture. Tibia I typically 3-3-1, basitarsus I, 2-3-2.

Palpus as shown in figure 203.

TYPES: Syntypes, females, from Georgia; Mt. Washington, New Hampshire; Peoria, Illinois. In the Simon collection, Museum National d'Histoire Naturelle, Paris, and in Koch collection, British Museum (Natural History).

DISTRIBUTION: Southern Canada, throughout much of the United States (except in the Plains states and the desert portions of the Southwest), and in northern Mexico in Chihuahua, Durango (Gertsch, 1953). The distribution in California is shown in map 32.

SEASONAL DATA: Mature forms have been taken from October through December. A reared male molted to maturity in September.

Locuples GROUP

Male palpus: Embolus originating near 180 degrees, less usually near 270 degrees, apical portion straight or curved retrolaterad; pars pendula terminating on truncus near 0 degrees of tegulum, less usually near 45 degrees; distal crescent usually present and well developed, ectal margin convex; bulbar apophyses well developed, directed prolaterad to prolaterodistad, usually hooklike and subequal in size, ABA tending to be somewhat smaller; MBA with a small, distiprolateral, basal tooth; apicotegular process usually well developed. Tutacular groove narrower than that of *pellax* group. Distal tooth of RTA visible from ventral view. Epigynum: Median

septum and lateral atria distinct; lateral septal tubercles elongate, narrow, and relatively widely spaced, separated by a distance greater than their width. Receptaculum: Bursa copulatrix U- or V-shaped, expanded proximally, distal portion bearing several usually distinct tubercles of spermathecal organ in a single oblique row (*locuples* subgroup) or tubercles not apparent (*gosiutus* subgroup); bursa copulatrix and spermatheca distinctly or indistinctly delimited from each other.

Two well-defined subgroups of the *locuples* group are found in California: the *locuples* and *gosiutus* subgroups.

Locuples SUBGROUP

Allatum entirely dark gray, red, or orange; mesodiscal and metadiscal primary setae of male short, subequal to, to shorter than, ALE diameter. Male palpus: Tutacular apophysis projecting obliquely from cymbium to beyond proximal margin of tegulum.

Xysticus (*Pellysticus*) *locuples* Keyserling

Xysticus locuples KEYSERLING, 1880, pp. 24-25, pl. 1, fig. 9. GERTSCH, 1939, p. 357.

Xysticus (*Xysticus*) *locuples*: GERTSCH, 1953, p. 423.

Xysticus (*Xysticus*) *malkini* GERTSCH, 1953, pp. 423-425, figs. 8, 9. New synonymy.

FEMALE: Average length about 8.5 mm. (locupline form), 6.5 mm. (intermediate and malkinine forms).

There are two extremes in markings, coloration, and chaetotaxy, between which all degrees of intergradations exist. The extremes can be referred to as the locupline and malkinine forms. (1) Locupline form: Allatum dark gray to brown; allatal stripes convergent caudal to metadiscus; secondary clypeal and usually secondary discal setae quite prominent; seta P2 directed mesiad, spiniform, usually double on each side; S5 in some cases subequal in length to S6; T2, T3, and T4 usually not distinguishable from secondary setal vestiture. Femora mostly white, with dark variegations. Dorsal, midsagittal, abdominal stripe pale, distinct from dorsolateral maculae; dorsolateral maculae concolorous with allatum; venter of abdomen paler than sides. (2) An intermediate form: Markings and chaetotaxy like those of locupline form, but



MAP 32. Distribution of *Xysticus gulosus* Keyserling.

allata and dorsolateral abdominal maculae orange. (3) Malkinine form: Allatum dark brick red; allatal stripes strongly convergent caudally along their entire length; secondary clypeal and discal vestiture not prominent and posterior primary carapace setae greatly reduced in length; otherwise chaetotaxy similar to that of locupline form. Femora mostly dark, with some pale variegations. Dorsal, midsagittal, abdominal stripe concolorous with dorsolateral maculae; dorsolateral abdominal maculae concolorous with allatum; venter of abdomen dark, concolorous with sides. Tibia I typically 0.5-1 or 0.4-1; basitarsus I, 2-4-2.

Epigynum as shown in figure 207.

Receptaculum (fig. 208): Bursa copulatrix with U-shaped convolution.

MALE: Average length about 5.5 mm. (locupline form), 5.0 mm. (malkinine form).

Markings and coloration like those of female, showing same range of variation. Carapace chaetotaxy as follows: (1) Locupline form: Seta P2 directed mesiad, short, subspiniform to spiniform; S3 and T1 spiniform, subequal in length to ALE diameter, other mesodiscals and metadiscals shorter; S5 subequal in length to S6; T2, in some cases, and T3 and T4 not markedly distinct from secondary setal vestiture; X-seta oriented transversely; caudoallatal setae spiniform, longer than PME interdistance. (2) Malkinine form: Differs from locupline form in the following respects: setae shorter; T1 not spiniform, but distinguishable and longer than PME diameter; X-seta oriented longitudinally; caudoallatal setae shorter than PME interdistance, longer than PME diameter. Tibia I typically 3-5-1, basitarsus I, 2-4-2.

Palpus (fig. 206): ABA hooklike, acuate.

TYPES: Syntype, male, and syntype, female, of *locuples* from Colorado and Nevada, in Simon collection at the Museum National d'Histoire Naturelle, Paris. Holotype, male, of *malkini* from Clackamas, Clackamas County, Oregon, June 25, 1942, B. Malkin, in the American Museum of Natural History.

DISTRIBUTION: "Western United States and Canada from New Mexico and Colorado to California and northern Mexico (Chihuahua), north into Montana, Oregon, and British Columbia" (Gertsch, 1953). The distribution in California is indicated in map 33.

ECOLOGY: *Locuples* in the Californian Province has been collected only in chaparral communities.

SEASONAL DATA: Mature individuals have been taken from April through October, most usually during June and July, especially in the latter month. A female taken in April laid eggs soon afterward, and two females were taken with egg sacs in July. Immatures collected in June or July matured in September or October but more usually underwent diapause until the following January through May. In one June collection from the Laguna Mountains (San Diego County), consisting of two immature males and two immature females, the females molted to maturity in September; the males, in the following March and April.

REMARKS: The distribution of the locupline, malkinine, and intermediate forms is shown in map 33. Differentiation between these forms is subjective, but it may be safe to assume that the forms designated as locupline or malkinine clearly exhibit the tendency characteristic for that type. The locupline form tends to be found in drier areas and is the common form in southern California. The malkinine form, conversely, tends to occur in areas of higher precipitation. The possibility that *Xysticus locuples* comprises three taxa in the Pacific coastal states is discussed above (pp. 28-29).

Xysticus (Pellysticus) apachecus Gertsch

Xysticus apachecus GERTSCH, 1933a, p. 22, fig. 24; 1939, p. 356.

Xysticus (Xysticus) apachecus: GERTSCH, 1953, p. 423.

FEMALE: Average length about 9.0 mm.

Body rather orange. Allatal stripes divergent at level of and caudal to metadiscus; discal setae greatly reduced in length, e.g., setae P1 and P3 only subequal to, and caudoallatal setae less than, ALE diameter; P2 directed mesiad, short, subspiniform; S5 spiniform, less than one-half of length of S6; T2 not distinct, and T3 and T4 not markedly distinct from secondary setal vestiture. Tibia I typically 3-5-1 or 3-6-1, but lateral spiniforms may not be developed; basitarsus I, 2-5-2.

Epigynum and receptaculum similar to those of *locuples*.

MALE: Average length about 6.0 mm.



MAP 33. Distributions of *Xysticus locuples* Keyserling and *X. apachecus* Gertsch.

Coloration and allatal stripes like those of female, but darker; discal setae greatly reduced in length, S3 not spiniform, T1 subequal to, to less than, ALE diameter; X-seta oriented longitudinally; caudoallatal setae not spiniform, short, subequal to PME diameter. Tibia I usually 3-7-1; basitarsus I usually 2-5-2, often with six or seven proven-tral spiniforms.

Palpus (fig. 209): Similar to that of *locuples*, but MBA and ABA more closely approximated apically than in typical *locuples* and ABA only slightly curved, and blunt rather than acute.

TYPE: Holotype, female, Blanding, Utah, June 17, 1928, in the American Museum of Natural History.

DISTRIBUTION: "Southwestern U. S. east into Texas (Austin)," the majority of records from Arizona (Gertsch, 1939, 1953). The distribution in California is shown in map 33.

SEASONAL DATA: An adult female was taken in May. An immature female collected in September underwent a winter diapause, molting to maturity the following April.

Gosiutus SUBGROUP

Allatal stripe mesial, greenish; mesodiscal and metadiscal primary setae of male long, from subequal to, to longer than, PME interdistance; setae C2, P2, T3, T4, and T5 often pale, other primary carapace setae dark. Male palpus: Tutacular apophysis projecting at nearly a right angle from cymbium and not beyond proximal margin of tegulum.

Xysticus (Pellysticus) gosiutus Gertsch

Xysticus gosiutus GERTSCH, 1933a, pp. 20-21, figs. 17, 21; 1939, p. 358.

Xysticus (Xysticus) gosiutus: GERTSCH, 1953, p. 425.

FEMALE: Average length about 6.0 mm.

Allatal stripes convergent caudal to metadiscus; primary carapace setae from subequal to, to longer than, PME interdistance; seta P2 directed mesiad, spiniform; S5 subspiniform, much weaker than S6; T2, T3, and T4 very well developed, distinct from secondary setal vestiture. Tibia I typically 0-4-1; basitarsus I, 2-4-2 or 2-5-2. Dorsum of abdomen largely pale, markings indistinct.

Epigynum: Similar to that of *locuples*.

Receptaculum (fig. 211): Bursa copulatrix with a V-shaped convolution; bursa and spermatheca not so clearly delimited as those of the *locuples* subgroup.

MALE: Average length about 5.0 mm.

Allatal stripes convergent caudal to metadiscus; seta C2 variously reduced; P2 directed mesiad, subspiniform to spiniform; S5 subspiniform or not spiniform, much weaker and shorter than S6; T2, T3, and T4 markedly distinct from secondary setal vestiture. Tibia I typically 3-4-1 or 3-5-1; basitarsus I, 2-4-2.

Palpus (fig. 210): Embolus originating near 180 degrees; pars pendula terminating near 0 degrees; distal crescent well developed; bulbar apophyses hook-shaped and usually subequal in size, although ABA may be slightly smaller; ABA inserted on bulb almost directly proximal to MBA; apicotegular process well developed.

TYPES: Holotype, male, allotype, female, Little Cottonwood Canyon, Salt Lake City, Utah, swept from wild rose, July 17, 1929, W. J. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Pacific coast states from British Columbia south to middle California; Utah (Gertsch, 1953). The distribution in California is shown in map 34.

ECOLOGY: *Gosiutus* in the Californian Province and in the Bullion District has been found only in chaparral communities.

SEASONAL DATA: Males and females have been taken from May through August, principally in June and July. Immatures collected from April through June in general matured by the next month; the latest immature collected, a female in July, molted to maturity in that month.

Xysticus (Pellysticus) chaparralis, new species

FEMALE: Unknown.

MALE: Average length about 4.5 mm.

Generally similar to *gosiutus* but allatal stripe may be wider, frontal row may consist of three principal spiniforms on each side, and carapace seta P2 is directed either laterad or mesiad. Tibia I typically 3-4-1; basitarsus I, 2-3-2 or 2-4-2.

Palpus (fig. 212): Embolus originating near 270 degrees; pars pendula terminating near



MAP 34. Distributions of *Xysticus gosiutus* Gertsch and *X. chaparralis*, new species.

45 degrees; distal crescent of tegulum not developed; bulbar apophyses smaller than those of other species of *locuples* group, ABA slightly smaller than MBA and inserted on tegulum distinctly prolateral to MBA; apicotegular process somewhat reduced.

TYPE: Holotype, male, Guatay, San Diego County, California, July 9, 1958, W. J. and J. W. Gertsch, in the American Museum of Natural History.

DISTRIBUTION: Known from California only (map 34).

ECOLOGY: This crab spider has been found only in chaparral.

SEASONAL DATA: Mature males have been taken in June and July. A penultimate male collected in May molted to maturity in that month.

REMARKS: This species appears to be a derivative of the more northerly *gosiutus* in which the bulbar parts have rotated apicad.

Pretiosus GROUP

Male palpus: Embolus originating near 0 degrees, apical portion, in tutacular groove, straight; pars pendula terminating near 90 degrees of tegulum; distal crescent not developed; bulbar apophyses projecting distad; MBA well developed, hooklike, and without a basal tooth; ABA markedly reduced, straight; apicotegular process reduced. Tutacular groove relatively narrow, typical of genus. Distal tooth of RTA not visible ventrally. Epigynum: Median septum not apparent as such, forming floor of epigynum; lateral septal tubercles reduced to wedgelike sclerites; lateral atria of epigynum not apparent. Receptaculum: Bursa copulatrix J-shaped, short, narrow, and tubular, only distal tip, entering spermatheca anteriomedially, visible dorsally; spermatheca distinctly delimited from bursa copulatrix; spermathecal organ tubercles not distinct.

Xysticus (Pellysticus) pretiosus Gertsch

Xysticus pretiosus GERTSCH, 1934, p. 6, fig. 3; 1939, p. 362.

Xysticus (Xysticus) pretiosus: GERTSCH, 1953, p. 427.

FEMALE: Average length about 5.5 mm.

Allatal stripes convergent caudal to metadiscus; primary discal setae stout, moderate in length, subequal to PME interdistance;

seta P2 directed mesiad; S5 short and subspiniform, distinctly weaker than S6; T3, T4, and usually T2 distinct from secondary setal vestiture, T3 and T4 more markedly so. Tibia I typically 0-4-1, but prolateral spiniforms may be present; basitarsus I, 1-3-2 or 2-3-2.

Epigynum as shown in figure 214. Receptaculum as shown in figure 215.

MALE: Average length about 4.0 mm.

PME, allatal stripes, and carapace chaetotaxy like those of female, but setae shorter, especially those of mesodiscus and metadiscus.

Palpus as shown in figure 213.

TYPE: Holotype, male, Forest Grove, Clear County, Oregon, in the American Museum of Natural History.

DISTRIBUTION: "Pacific Northwest from California to British Columbia" (Gertsch, 1953). The distribution in California is shown in map 35.

ECOLOGY: *Pretiosus* in the Californian Province is most abundant near the coast in low-lying communities and is infrequent in chaparral.

SEASONAL DATA: Males have been taken from March through June and females as late as August, both most commonly in June.

Lutzi GROUP

Male palpus: Embolus originating near 225 degrees, apical portion, in tutacular groove, S-shaped; pars pendula terminating near 0 degrees of tegulum; distal crescent well developed, distally convex; MBA greatly reduced, without a basal tooth; ABA rather massively developed, broadly curved, its tip acute; apicotegular process reduced. Tutacular groove broad and deep. Distal tooth of RTA visible ventrally. Epigynum: Median septum and lateral atria distinct, septum high, broadening caudad, and flat, lateral septal tubercles not developed. Receptaculum: Bursa copulatrix and spermatheca not distinctly delimited from each other; tubercles of spermathecal organ numerous, small, restricted to an anteriolateral area of receptaculum.

Xysticus (Pellysticus) lutzi Gertsch

Xysticus apertus BANKS (penultimate male syntype, not female lectotype), 1898, p. 259. New synonymy (see below under Remarks).



MAP 35. Distributions of *Xysticus pretiosus* Gertsch, *X. aprilinus* Bryant, *X. coloradensis* Bryant, and *X. lutzi* Gertsch.

Xysticus lutzi GERTSCH, 1935, pp. 27-29; 1939, p. 382.

Xysticus arizonicus GERTSCH, 1939, p. 377, fig. 195. Synonymy with *lutzi* by Gertsch (*in litt.*).

Xysticus (Xysticus) arizonicus: GERTSCH, 1953, p. 441.

Xysticus (Xysticus) lutzi: GERTSCH, 1953, p. 445.

FEMALE: (Based mainly on two Californian females). Average length about 8.0 mm.

Allatal stripes convergent caudal to metadiscus; primary carapace setae stout, longer than PME interdistance; seta P2 directed laterad; S5 moderate in length, spiniform, subequal in length to S6; T2 not markedly distinct from secondary discal setae, but T3 and T4 usually distinct, although secondary setae well developed; secondary setal vestiture of clypeus also prominent. Tibia I, 0-3-1 or 0-4-1; basitarsus I, 2-3-2 or 1-3-2.

Epigynum as shown in figure 225. Receptaculum as shown in figure 226.

MALE: (Based on one Arizonan specimen). Length about 4.5 mm.

PME like those of female; primary mesodiscal and metadiscal setae short and stout; seta P2 directed mesiad, not spiniform; S5 not spiniform, much weaker than S6; T2 discrete from secondary setae. Tibia I, 0-3-1; basitarsus I, 2-3-2, with sparse spiniforms.

Palpus as shown in figure 216.

TYPES: Holotype, male, of *lutzi* from Kits Peak Rincon, Baboquivari Mountains, Arizona, July 31 to August 3, 1916, F. E. Lutz, in the American Museum of Natural History. Holotype, female, of *arizonicus* from Black Mountain, San Xavier del Bac Indian Reservation, near Tucson, Arizona, August 4, 1937, P. Steckler, in the American Museum of Natural History.

DISTRIBUTION: Chihuahua to New Mexico and westward to Baja California and California (Gertsch, 1953). The distribution in California is shown in map 35.

SEASONAL DATA: Adult females have been taken in June.

REMARKS: The carapace setae of the female are extremely variable in form and length. In the specimens examined from California and Arizona the setae are long and setiform but stout; in some Mexican populations, including those of northern Baja California,

the setae are much shorter and are blunt to claviform.

Banks (1898) described *Xysticus apertus* from a female and a penultimate male and figured the epigynum. Only the penultimate male is left in the vial, the female having been destroyed (Gertsch, 1953). The penultimate male is *lutzi*. I here select the figure of the epigynum of the female as the representation of the lectotype of *apertus*. The female *apertus* is probably a *Xysticus* described under a different name, but the description and figure of *apertus* would seem to preclude certain identification.

Concursus SERIES

Frontal row with three principal spiniforms on each side. Male palpus: Bulbar apophyses short, straight, and blunt, MBA without a basal tooth, secondary ABA present, produced as a strong, bulbous, prolateral outgrowth of the tegulum. Tibia with a retro-laterally produced area between VTA and RTA bearing modified setae. Epigynum: Mounted on a broad prominence and inclined caudad.

The *Xysticus concursus* series comprises three infrequently collected species found in the southwestern United States and adjacent Mexico. *Xysticus concursus* Gertsch is known only from Texas, but the other two species occur in California.

Xysticus (Pellysticus) aprilinus Bryant

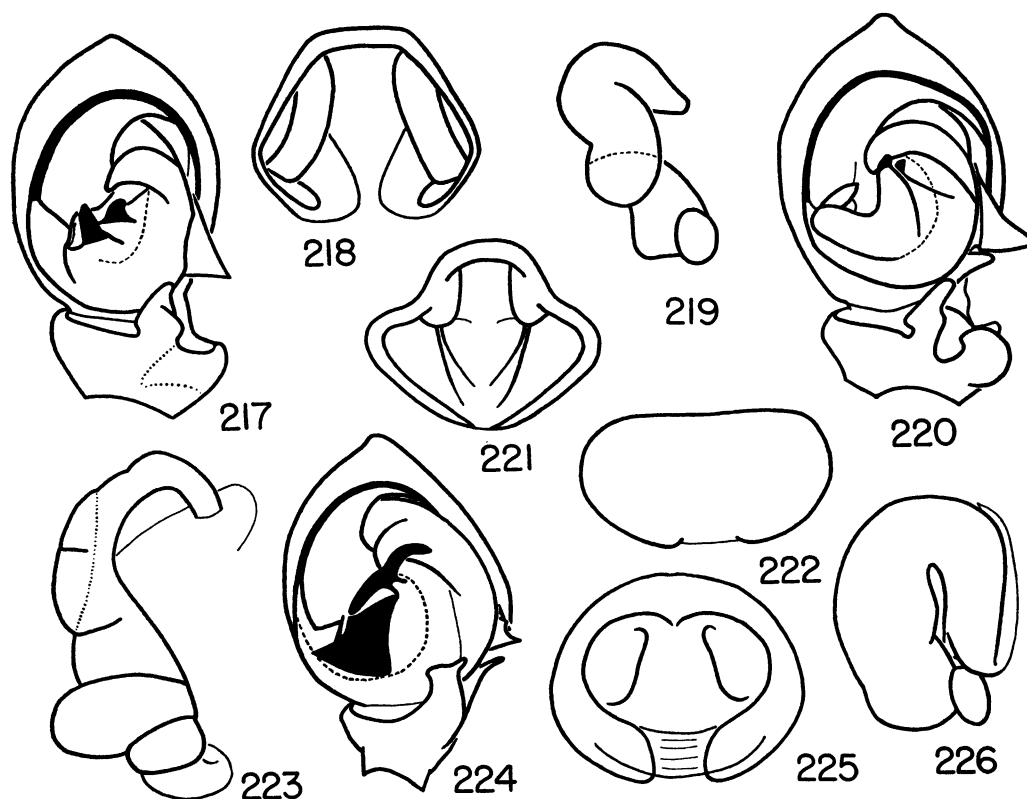
Xysticus aprilinus BRYANT, 1930, p. 132, fig. 4. GERTSCH, 1939, p. 381.

Xysticus (Xysticus) aprilinus: GERTSCH, 1953, p. 445.

FEMALE: (Based mainly on one Californian specimen). Length about 6.5 mm.

Allatal stripe brown, mesial, remainder of allatum white, stripes divergent at level of metadiscus; primary carapace setae pale, most longer than PME interdistance; seta P2 directed laterad; S5 short, not spiniform, much weaker than S6; T2 discrete, but T3 and T4 only slightly distinguishable from the secondary setal vestiture. Tibia I, 3-4-1; basitarsus I, 2(1)-3-1 or 2(1)-3-2.

Palpus (fig. 217): MBA slightly smaller than primary ABA; primary ABA situated in proximal half of bulb; secondary ABA less



FIGS. 217-219. *Xysticus aprilius* Bryant. 217. Male palp, ventral view. 218. Epigynum. 219. Receptaculum, dorsal view.

FIGS. 220, 221. *Xysticus coloradensis* Bryant. 220. Male palp, ventral view. 221. Epigynum.

FIGS. 222-224. *Xysticus lassanus* Chamberlin. 222. Epigynum. 223. Receptaculum, dorsal view. 224. Male palp, ventral view.

FIGS. 225, 226. *Xysticus lutzii* Gertsch. 225. Epigynum. 226. Receptaculum, dorsal view.

strongly produced than that in *coloradensis*; apicotegular process without distal fold. Area between VTA and RTA not forming a discrete lobe, as in *coloradensis*, with a vestiture of short, stout spiniforms; RTA not curved ventrad.

TYPE: Holotype, female, El Paso, Texas, April, collected by Soltau, in the Museum of Comparative Zoölogy.

DISTRIBUTION: Western Texas to California, Chihuahua (Gertsch, 1953). The distribution in California is shown in map 35.

SEASONAL DATA: Mature forms have not yet been collected in the state. One immature female matured in August.

REMARKS: This handsome species can be distinguished in all stages by the allatal markings.

***Xysticus* (*Pellysticus*) *coloradensis* Bryant**

Xysticus coloradensis BRYANT, 1930, pp. 133-134, figs. 1, 3. GERTSCH (male only), 1939, p. 380.

Xysticus (*Xysticus*) *coloradensis*: GERTSCH, 1953, p. 444.

FEMALE: (Based on one New Mexican specimen). Length about 7.5 mm.

Allatal stripes converging along entire length of mesodiscus and metadiscus; primary carapace setae pale, long, and slender, discals from subequal to, to longer than, PME interdistance; P2 directed laterad, S5 short, subspiniform, much weaker than S6; T2, T3, and T4 markedly distinct from secondary setal vestiture. Tibia I, 0-3-1 or 0-4-1; basitarsus I, 2-4-3 or 2-5-3.

Epigynum (fig. 221): Structures situated in a deep depression. Epigynal rim with three

broadly rounded emarginations, one anteromedial and two bilateral; median septum distinct, low, ridgelike; lateral atria deep, extending anteriolaterad beneath lateral emarginations of epigynal rim.

Receptaculum: Not examined.

MALE: (Based on one Californian specimen). Length 5.5. mm.

Primary discal setae long, subequal to, to longer than, PME interdistance, X-seta slightly less; P2 directed laterad; T2 appearing to be "double"; T3 and T4 markedly distinct from secondary discal setae. Tibia I apparently quite variable in spiniformation, 0-5-1 and 4(2)-5-1; basitarsus I, 2(1)-4-3 and 3-4-3.

Palpus (fig. 220): Primary bulbar apophyses subequal in length and situated near center of bulb; secondary ABA a very large, prolaterally directed structure; apicotegular process with a distal fold. Area between VTA and RTA produced as a strongly projecting, discrete, rounded lobe with a vestiture of curved setae; RTA long, arched ventrolaterad, tip

forming a conspicuous structure just proximal to tutacular apophysis.

TYPE: Holotype, male, Fort Collins, Colorado, in the Museum of Comparative Zoölogy.

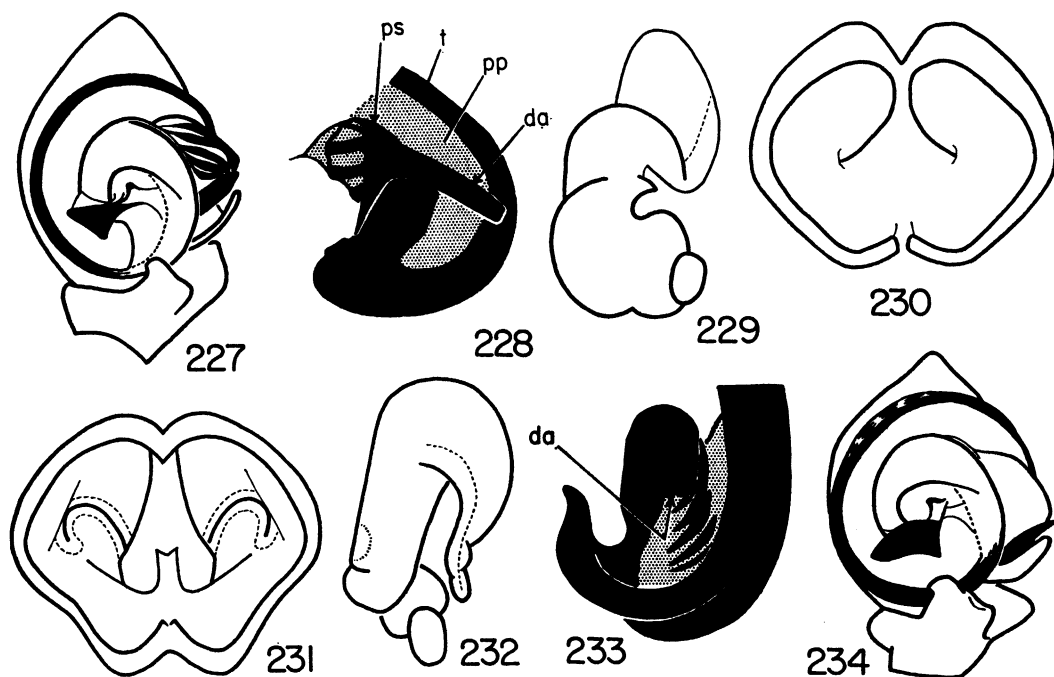
DISTRIBUTION: Great Basin of the western United States, from California to Colorado, Utah, and New Mexico (Gertsch, 1953). The distribution in California is shown in map 35.

SEASONAL DATA: Mature specimens have been taken in October and November throughout the range of this species.

SUBGENUS *XYSTICUS* C. L. KOCH

TYPE: *Aranea audax* Schrank, 1803.

Frontal row usually comprising three principal spiniforms on each side. Male palpus: Truncus very robust; pars pendula typically broadly developed along nearly entire length of truncus, with a mesoapical fold forming pendular sclerite; distal crescent well developed; MBA present, but primary ABA typically absent; apicotegular process typically greatly developed and sclerotized, form-



FIGS. 227-230. *Xysticus gertschi*, new species. 227. Male palpus, ventral view. 228. Apical portion of embolus, retrolateral view. 229. Receptaculum, dorsal view. 230. Epigynum.

FIGS. 231-234. *Xysticus californicus* Keyserling. 231. Epigynum. 232. Receptaculum, dorsal view. 233. Apical portion of embolus, retrolateral view. 234. Male palpus, ventral view.

Abbreviations: da, dorsal apophysis; pp, pars pendula; ps, pendular sclerite; t, truncus.

ing secondary ABA. Tutacular apophysis of *californicus* type. VTA simple and ITA developed as a small independent lobe, or with ITA broadly joined to its retrolateral margin; distal tooth of RTA minute or not apparent. Receptaculum: Spermatheca without transverse seams.

The Californian segment of this subgenus is represented only by the *cunctator* series. In this series, the MBA is greatly reduced and the secondary ABA is roughly triangular in shape, the pendular sclerite bears a dorsal apophysis (figs. 228, 233, da), and the ITA is broadly joined to the VTA, with only a very slight apical emargination separating the two.

***Xysticus (Xysticus) gertschi*, new species**

Xysticus quinquepunctatus: GERTSCH, 1934, p. 4; 1939, p. 389. *Nec X. quinquepunctatus* of Keyserling, 1880.

Xysticus (Xysticus) quinquepunctatus: GERTSCH, 1953, p. 449.

FEMALE: Average length about 5.0 mm.

Allatal stripe brown, mesial, diverging at level of metadiscus; carapace setae pale, usually slightly shorter than, to subequal to, PME interdistance; P2 directed laterad; S5 not spiniform, much shorter than S6; T2 typically distinct and T3 and T4 setae distinct from secondary setal vestiture. Tibia I typically 0-3-1; basitarsus I, 2-3-2. Dorsum of abdomen often unmarked and entirely creamy white.

Epigynum (fig. 230): Median septum low and flat and markedly broadened caudad; intromittent orifice obscure, situated beneath a membranous flap just lateral to posterior tip of septum.

Receptaculum (fig. 229): Bursa copulatrix and spermatheca distinctly delimited from each other; bursa copulatrix pale yellow, translucent, spermatheca darker; tubercles of spermathecal organ not apparent.

MALE: Average length about 3.5 mm.

Allatal stripes parallel along their entire length; most primary discal setae subequal to, to longer than, PME interdistance; seta S4 occasionally not developed; T3 and T4 not spiniform, otherwise carapace chaetotaxy like that of female. Tibia I typically 3-3-1; basitarsus I, 2-2-2 or 2-3-2.

Palpus (figs. 227, 228): Truncus terminating as a rounded lobe; pars pendula between

apical sclerite and truncus without sclerotized ridges; pendular sclerite (ps) a series of sclerotized ridges along entire ventral surface of mesoapical pendular fold; dorsal apophysis of sclerite (da) prominent, long, and slender, extending dorsad to level of truncus; distal margin of ABA straight.

TYPE: Holotype, male, Eagle Lake, north-west shore on Susanville-Adin road, Lassen County, California, June 20, 1958, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: "Rocky Mountains of United States and Canada, westward to British Columbia and California, south into Chihuahua" (Gertsch, 1939). The distribution in California is shown in map 36.

SEASONAL DATA: Adults have been taken from April through June, most commonly in May and June.

REMARKS: *Xysticus quinquepunctatus* Keyserling, described from Colorado, would appear to be *X. cunctator* Thorell, judged by the figure of the epigynum of the holotype female.

***Xysticus (Xysticus) californicus* Keyserling**

Xysticus californicus KEYSERLING, 1880, pp. 37-39, pl. 1, fig. 17. Synonymy with *cunctator* by Gertsch (1934) disclaimed.

Xysticus cunctator: GERTSCH (in part), 1934, p. 11; 1939, p. 390.

Xysticus (Xysticus) cunctator: GERTSCH (in part), 1953, p. 448.

FEMALE: Average length about 7.0 mm.

Allatal stripes parallel but in some cases with a pale, converging, triangular area caudal to metadiscus; primary carapace setae dark, slender, and usually slightly less to longer than PME interdistance; seta P2 directed laterad; S5 not spiniform, much shorter and weaker than S6; T2 distinct and T3 and T4 markedly distinct from secondary setal vestiture. Tibia I typically 0-4-1 or 0-3-1; basitarsus I, 2-3-2 or 1-3-2.

Epigynum (fig. 231): Median septum ridgelike, not so markedly broadened posteriorly as that of *gertschi*: intromittent orifice elongate and slitlike, with mesial oblique and shorter lateral longitudinal segment, the latter in some cases partly covered by a lateral membranous flap.

Receptaculum (fig. 232): Proximal arm communicating to the outside via mesial



MAP 36. Distributions of *Xysticus gertschi*, new species, and *X. californicus* Keyserling.

oblique segment of intromittent orifice; spermatheca not distinctly delimited from bursa copulatrix; tubercles of spermathecal organ not apparent.

MALE: Average length about 5.0 mm.

Carapace similar to that of female. Tibia I typically 3(1)-3-1; basitarsus I, 2-3-2.

Palpus (figs. 233, 234): Terminal portion of truncus recurved; pars pendula between apical pendular sclerite and truncus with parallel sclerotized ridges; pendular sclerite apparent ventrally as an elongate apical sclerite on mesoapical fold; dorsal apophysis (da) short, not reaching dorsad to level of truncus and difficult to discern in hardened specimens owing to dark background of sclerotized pendular ridges; distal margin of ABA curved.

TYPE: Holotype, female, Mariposa County, California, in Simon collection at Museum National d'Histoire Naturelle, Paris.

DISTRIBUTION: Pacific coast states from British Columbia (Gertsch, *in litt.*) south to California. The distribution in California is shown in map 36.

SEASONAL DATA: Mature forms have been taken commonly from May through July in the Humboldtian and Sierran districts, and from March through July elsewhere. Adults probably occur throughout the year but are much less common in the late summer and fall. Immatures taken from June through November molted to maturity in late winter or early spring.

REMARKS: *Xysticus californicus* is close to *X. cunctator* Thorell, a common Rocky Mountain species. The palpus of *cunctator* is smaller, the pars pendula between the pendular sclerite and truncus is not sclerotized, and, in specimens examined from Montana, Wyoming, and Utah, the bulb is more weakly sclerotized. In specimens from Williams, Arizona, however, the bulb showed a stronger sclerotization than that in the more northern forms. The form of the dorsal apophysis of the apical sclerite is variable in *cunctator* but constant in *californicus*.

Californicus mates readily in captivity. In a control mating, the male copulated immediately and with ease when placed with a female. A female *cunctator*, collected immature near Williams (Arizona) and reared to maturity, was mated with a reared *californi-*

cus male from Little Rock (Los Angeles County). The male had considerable difficulty in accomplishing copulation owing, seemingly, to an inability to orient the palpus properly, but copulation finally occurred after an unusually long delay. Out of 20 to 30 eggs laid, only two were viable, and of the two spiderlings one did not successfully shed the deutovum cuticle.

SUBGENUS *LASSYSTICUS*, NEW SUBGENUS

TYPE: *Xysticus lassanus* Chamberlin, 1925.

Frontal row comprising four or more principal spiniforms on each side. Male palpus: Embolus of generalized type; distal crescent not developed; MBA present, primary ABA absent; secondary distal ABA present, a prolateral outgrowth of tegulum; apicotegular process reduced, membranous. Tutacular apophysis similar to *montanensis* type, possibly representing a reduced form of *locuples* type. VTA with a small apical division, basal lobe greatly reduced; distal tooth of RTA small; ITA apparently absent. Receptaculum: Spermatheca without transverse seams.

This is a monotypic subgenus represented by the relict *Xysticus lassanus* Chamberlin. *Lassysticus* shows apparent affinities to *Pellysticus*, on one hand, in the similarity of the secondary ABA to that of the *concurus* series and the form of the VTA and tutacular apophysis which possibly represent degenerative stages of an originally pellysticine structure; and, on the other hand, to the subgenus *Xysticus* in the similarity of the MBA and secondary ABA to those of the *ferox* series and of the VTA to that of the more primitive species of the subgenus *Xysticus*. In either case, *X. lassanus*, of contemporary forms, seems to be alone on a branch of the phylogenetic tree of *Xysticus*.

Xysticus (Lassysticus) lassanus Chamberlin

Xysticus lassanus CHAMBERLIN, 1925, p. 218. GERTSCH, 1939, p. 360.

Xysticus coloradensis BRYANT (female, not male holotype), 1930, p. 133. GERTSCH (female only), 1939, p. 380.

Xysticus (Xysticus) lassanus: GERTSCH, 1953, p. 431.

FEMALE: Average length about 6.5 mm.

Allatal stripes convergent caudal to metadiscus; primary discal setae pale and shorter than PME interdistance; secondary setae of

clypeus and disc prominent; seta P2 directed mesiad; S5 spiniform, moderate in length, and subequal to S6; T1 often closer to X-seta than to S3; T2 appearing multiple owing to development of secondary setae. Tibia I typically 0-2-1, basitarsus I, 1-3-2.

Epigynum (fig. 222): A broad and ovoid depression lacking obvious structures, membranous median septum present, hidden beneath anterior portion of epigynal rim.

Receptaculum (fig. 223): Bursa copulatrix and spermatheca not distinctly delimited from each other, the receptaculum gradually increasing in diameter distad, strongly arched in proximal portion where spermathecal organ tubercles are numerous.

MALE: Average length about 4.5 mm.

Allatal stripes slightly convergent along their entire lengths; primary prodiscal setae subspiniform, longer than ALE diameter; mesodiscal and metadiscal primary setae, except for S3, not even subspiniform, shorter than ALE diameter, in some cases not discrete; P2 directed laterad; T2, T3, and T4 not markedly distinct from secondary setal vestiture. Tibia I typically 3-3-1; basitarsus I, 2-3-2.

Palpus (fig. 224): MBA T-shaped; ABA broad, flat, and acuate, ventral face about parallel to surface of tegulum.

TYPE: Holotype, male, of *lassanus*, Roberts, Texas, ex stomach of *Geococcyx californicus* (Lesson), in Museum of Comparative Zoölogy.

DISTRIBUTION: Southwestern United States and Chihuahua (Gertsch, 1953). The distribution in California is shown in map 37.

ECOLOGY: *Lassanus* is often found on the under side of fallen logs.

SEASONAL DATA: Adults have been taken from February through May, but an immature female collected in June matured in the following September.

SUBGENUS PROXYSTICUS DALMAS

TYPE: *Thomisus lalandei* Savigny, 1825.

Frontal row comprising three or more principal spiniforms on each side. Male palpus: Embolus of generalized type but pars pendula in some cases sclerotized mesially; distal crescent not present; MBA lacking; ABA (uncertain homology with secondary ABA of some species of *Pellysticus*) weakly produced

(lacking in *triangulosus* series); apicotegular process reduced (uncertain homology) or absent. Tutacular apophysis typically of *montanensis* type, rarely of *locuples* type. ITA well developed (except in *triangulosus* series); distal tooth of RTA well developed (except in *triangulosus* series). Receptaculum: Spermatheca with transverse seams (except in *lalandei* series).

The *montanensis* series, the only series of *Proxysticus* represented in California, is characterized in the male by the low ABA the apical margin of which usually forms a narrow ridge, the well-developed ITA broadly joined to the VTA, and the broad distal tooth of the RTA which extends distad to or beyond the tutacular apophysis, and in the female by the epigynal rim sclerites and the flat posterior, membranous, median septum passing between the rim sclerites.

Two groups of the *montanensis* series can be recognized in California: *montanensis* and *luctuosus*.

Montanensis GROUP

Male palpus: Embolus originating near or basal to 270 degrees and reaching tutacular apophysis; pars pendula entirely membranous mesially; basal tegular ridge situated in prolateral half of tegulum; ridgelike ABA situated in proximal half of tegulum. VTA and ITA separated by deep, apical emargination.

Xysticus (*Proxysticus*) *punctatus* Keyserling

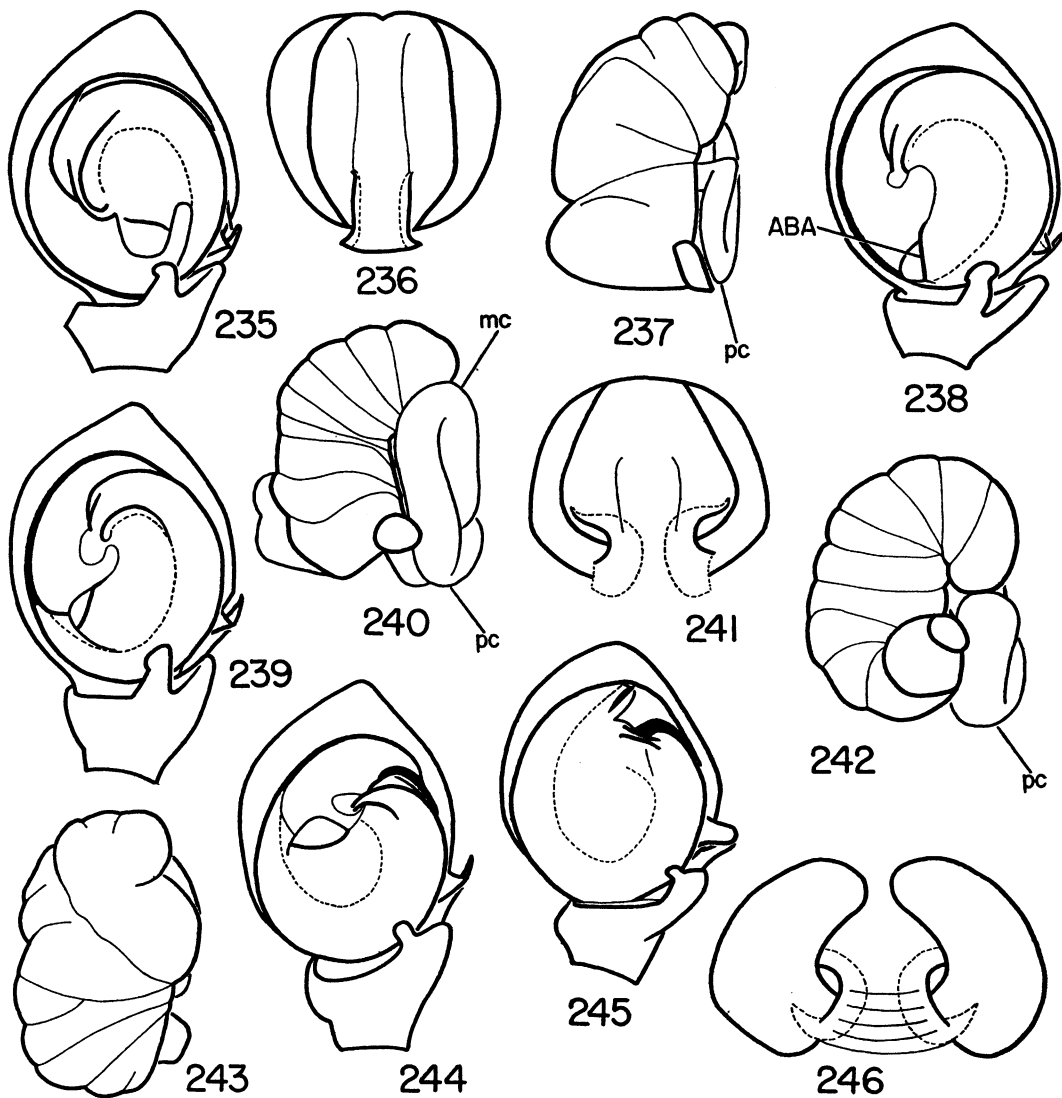
Xysticus punctatus KEYSERLING, 1880, pp. 30-31, pl. 1, fig. 13. GERTSCH, 1939, pl. 393.

Xysticus (*Spiracme*) *punctatus*: GERTSCH, 1953, p. 450.

FEMALE (Based on one Montanan specimen). Length 7.0 mm.

Body orangish brown. Allatal stripes converging caudally along their entire length; primary carapace setae very slender, less than PME interdistance; frontal row with three principal spiniforms on each side, but seta C2 fairly well developed; clypeus with a dense vestiture of secondary spiniforms; P2 directed mesiad, spiniform, moderate in length; T2 distinct, but T3 and T4 short, not spiniform, and not markedly distinct from secondary setal vestiture. Tibia I, 0-4-1 and 0-5-1; basitarsus I, 1-4-2 and 1-5-2.

Epigynum (fig. 236): Median septum nar-



FIGS. 235-237. *Xysticus punctatus* Keyserling. 235. Male palpus, ventral view. 236. Epigynum. 237. Receptaculum, dorsal view.

FIGS. 238. *Xysticus iviei iviei*, new species, male palpus, ventral view.

FIG. 239. *Xysticus montanensis* Keyserling, male palpus, ventral view.

FIG. 240. *Xysticus iviei iviei*, new species, receptaculum, dorsal view.

FIGS. 241, 242. *Xysticus montanensis* Keyserling. 241. Epigynum. 242. Receptaculum, dorsal view.

FIG. 243. *Xysticus benefactor* Keyserling, receptaculum, dorsal view.

FIG. 244. *Xysticus pearcei*, new species, male palpus, ventral view.

FIGS. 245, 246. *Xysticus benefactor* Keyserling. 245. Male palpus, ventral view. 246. Epigynum.

Abbreviations: mc, median convolution; pc, proximal convolution (both of bursa copulatrix).

rower than that of *montanensis*, sides generally more or less parallel.

Receptaculum (fig. 237): Bursa copulatrix S-shaped in longitudinal plane, distal convolution situated anterior and lateral to proximal convolution (pc) and hidden, from dorsal aspect, by spermatheca.

MALE: (Based on one specimen from Connecticut). Length 4.5 mm.

Allatal stripes convergent caudal to metadiscus; mesodiscal and metadiscal setae short, less than diameter of ALE; P2 directed mesiad, short, subspiniform; T3 and T4 not spiniform nor distinct from secondary setal vestiture; S5 short, not spiniform.

Palpus (fig. 235): Embolus originating near 135 degrees; ridgelike ABA transverse, situated in proximoretrolateral quadrant of tegulum.

TYPE: Holotype, male, North Carolina, Simon collection, in Museum National d'Histoire Naturelle, Paris.

DISTRIBUTION: "Canada from Nova Scotia to British Columbia and the northern United States, south to North Carolina and east Texas in the east, to Colorado and California in the west" (Gertsch, 1953). The only record from California is Potter Creek Cave, near Shasta Lake (Gertsch, 1953).

***Xysticus (Proxysticus) iviei iviei*,
new subspecies**

FEMALE: Average length about 7.5 mm.

Markings and chaetotaxy like those of *montanensis*. Tibia I, 0-3-1; basitarsus I, 1-3-2.

Epigynum: Like that of *montanensis*.

Receptaculum (fig. 237): Bursa copulatrix much longer than that of *montanensis*, with three distinct convolutions, distal arm of proximal convolution (pc; distal arm shown adjacent to spermatheca) more than twice length of proximal arm; anterior portion of spermatheca directed mesiad.

MALE: Average length about 4 mm.

Carapace and spiniformity like those of *montanensis*. Leg spiniformity constant in all specimens examined: tibia I, 3-3-1; basitarsus I, 1-3-2.

Palpus (fig. 238): Embolus originating near 180 degrees; length of tegulum 0.56-0.57 mm.; ridgelike ABA longitudinal, situated in proximal half of tegulum close to longitudinal

midline and closer to peripheral margin of tegulum than that in typical *montanensis* (cf. fig. 239).

TYPE: Holotype, female, Tapia Park, Santa Monica Mountains, Los Angeles County, California, May 1, 1954, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 37).

SEASONAL DATA: Adults have been taken from February through June.

REMARKS: This species is named for Wilton Ivie who first recognized its distinctness.

***Xysticus (Proxysticus) iviei sierrensis*,
new subspecies**

FEMALE: Unknown.

MALE: (Based on three specimens). Markings and chaetotaxy similar to those of *i. iviei* and *montanensis*.

Palpus: Similar to that of *i. iviei* but tegulum smaller, 0.42-0.50 mm.

TYPE: Holotype, male, Alpine Camp, on state highway 89 (leaf litter), El Dorado County, California, July 8, 1959 (maturation date in laboratory July 17, 1959), in leaf detritus, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 37).

SEASONAL DATA: Two males have been taken in September, but the holotype, collected in July, molted to maturity in that month.

REMARKS: *Sierrensis* appears to differ morphologically from *iviei* only in the smaller genital bulb. Also, the holotype, the only specimen of *sierrensis* collected personally, was collected in pine-needle litter, whereas those specimens of *iviei* personally collected were taken on vegetation.

***Xysticus (Proxysticus) montanensis*
Keyserling**

Xysticus montanensis KEYSERLING, 1887, pp. 479-481, pl. 6, fig. 40. GERTSCH, 1939, p. 395.

Xysticus hesperus GERTSCH, 1934, pp. 6-7, fig. 11. Synonymy with *montanensis* by Gertsch, 1939.

Xysticus (Spiracme) montanensis: GERTSCH, 1953, p. 451.

FEMALE: Average length about 7.0 mm.

Allatal stripes converging caudally along their entire length; primary discal setae in



MAP 37. Distributions of *Xysticus iviei iviei*, new subspecies, *X. i. sierrensis*, new subspecies, *X. montanensis* Keyserling, and *X. lassanus* Chamberlin.

general shorter than PME interdistance; secondary setal vestiture of clypeus and disc well developed and prominent, masking primary setae; frontal row in some cases with three principal spiniforms on each side but, owing to presence of strong secondary spiniforms on clypeus, apparently four or more; seta P2 directed mesiad, short but spiniform; S5 spiniform, moderate in length, subequal to S6; T1 closer to S3 than to X-seta; T2 usually appearing to be multiple; T3 and T4 distinct from secondary setal vestiture. Tibia I typically 0-3-1 or 0-4-1; basitarsus I, 1-3-2 or 1-4-2.

Epigynum (fig. 241): Sides of median septum concave.

Receptaculum (fig. 242): Bursa copulatrix usually with a single convolution (pc), in some cases with a second convolution distally, the latter not visible dorsally owing to approximation of distal end of proximal convolution and anterior end of spermatheca; distal arm of proximal convolution about as long as proximal arm; anterior portion of spermatheca typically directed caudad.

MALE: Average length about 4.5 mm.

Allatal stripes converging caudally along their entire length; primary mesodiscal and metadiscal setae usually roughly subequal to ALE diameter; frontal row with three or four principal spiniforms on each side; seta P2 directed mesiad, short but spiniform; S5 slightly weaker and shorter than S6; T3 and T4 only slightly distinct from secondary setal vestiture.

Palpus (fig. 239): Embolus originating near 270 degrees; ridgelike ABA oblique, occasionally longitudinal, situated in proximoprolateral quadrant of tegulum, separated from proximal margin of tegulum by distance about equal to its length.

DEVIATES: Four males, reared (Palmdale and vicinity, Los Angeles County): Ridge of ABA similar to that of *i. iviei* and *i. sierrensis*. However, a fifth male from the same area (also reared) showed an ABA more typical of *montanensis*. One male, associated with a normal male (Gaviota Pass, Santa Barbara County): ABA similar to that of *i. iviei* and *i. sierrensis*, but situated farther from periphery of tegulum than in those forms. Three females (Clayton, Contra Costa County):

Anterior portion of spermatheca directed cephalad.

TYPES: Syntype, male, and syntype, female, of *montanensis*, Montana, Marx, in the United States National Museum. Holotype, male, of *hesperus**, Atherton, California, in the American Museum of Natural History.

DISTRIBUTION: "Western United States, western Canada and Alaska" (Gertsch, 1953). The distribution in California is shown in map 37.

SEASONAL DATA: Mature males have been taken from November through March; females, from November through July. However, a penultimate male taken in July molted to maturity in that month, and other immatures collected from April through July matured in August and September.

REMARKS: Despite the widespread boreal distribution of *montanensis*, this species is not recorded from the Sierran District.

Luctuosus GROUP

Male palpus: Embolus originating from 315 to 360 degrees and not reaching tutacular apophysis; pars pendula sclerotized mesially; basal tegular ridge situated in retrolateral half of tegulum; ridge of ABA situated in or near distal half of tegulum. VTA and ITA separated by apical emargination shallower than that of *montanensis* group.

Gertsch (*in litt.*) considers the American *lutulentus* Gertsch, 1934, to be synonymous with the Palearctic *luctuosus* Blackwall, 1836.

The *luctuosus* group also includes *Xysticus inornatus* Emerton, 1892 (= *Synema bicolor* Keyserling, 1880), and *Synema obscura* Keyserling, 1880. A specific name for the latter species is not available in *Xysticus*.

Xysticus (*Proxysticus*) *pearcei*, new species

FEMALE: Unknown.

MALE: (Based on holotype). Length about 3.5 mm.

Carapace markings and chaetotaxy similar to those of *montanensis*, but allatal stripes more strongly convergent and mesodiscus darker. Tibia I, 0-3-1; basitarsus I, 0-2-2.

Palpus (fig. 244): Embolus originating near 270 degrees; ABA, a transverse ridge situated

near horizontal midline of tegulum, not so strongly produced as in *benefactor*. VTA and ITA separated by deeper apical emargination than that of *benefactor* (cf. fig. 245); distal tooth of RTA extending distad of tutacular apophysis.

TYPE: Holotype, male, 1½ miles west of Dripping Springs Public Camp on state highway 71, Riverside County, California, April 19, 1958, R. X. Schick, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 38).

REMARKS: *Pearcei* differs from *luctuosus* in having a more elongate ABA and shorter embolus. The epigynum and receptaculum will probably be found to be similar to those of *luctuosus* or *benefactor*.

Xysticus pearcei is named for W. M. Pearce in recognition of his collecting which has contributed substantially to the knowledge of the araneid fauna of California.

***Xysticus (Proxysticus) benefactor*
Keyserling**

Xysticus benefactor KEYSERLING, 1880, pp. 22-24, pl. 1, fig. 8. GERTSCH, 1939, pp. 399-401.

Xysticus (Spiracme) benefactor: GERTSCH, 1953, pp. 452-453.

FEMALE: Average length about 6.5 mm.

Allatal stripes convergent caudal to metadiscus; primary carapace setae subequal to, to longer than, PME interdistance; frontal row with three principal spiniforms on each side; seta P2 directed laterad; S5 short and not spiniform, much weaker than S6; T2, T3, and T4 distinct from secondary setal vestiture. Tibia I typically 0-3-1; basitarsus I quite variable, 0-2-1 to 1-4-2.

Epigynum (fig. 246): Rim sclerites broader and median septum proportionately broader, in relation to length of rim sclerites, than those of other *Proxysticus*; posterior portion of median septum with transverse folds.

Receptaculum (fig. 243): Bursa copulatrix very short, not convoluted.

MALE: Average length about 4.0 mm.

Allatal stripes convergent along margins of mesodiscus and metadiscus; primary discal setae moderate in length, shorter than PME interdistance; frontal row comprising three principal spiniforms on each side; seta P2 di-

rected laterad; S5 short, not spiniform, subequal in length to S6 which is spiniform; T2, T3, and T4 distinct from secondary setal vestiture. Tibia I typically 0-3-1, although one or two prolateral spiniforms may be developed; basitarsus I, 0-3-2 in all specimens examined.

Palpus (fig. 245): Embolus originating near 0 degrees; ABA more strongly produced than in other Californian species of anapophysate division, oriented obliquely to longitudinal plane, situated near distal apex of tegulum. VTA and ITA separated by an apical emargination more shallow than that in *pearcei* (cf. fig. 244); distal tooth of RTA extending distad to level of tutacular apophysis.

TYPES: Syntypes, male, female, Colorado, in the Simon collection, Museum National d'Histoire Naturelle, Paris.

DISTRIBUTION: "Western United States and Canada" (Gertsch, 1953). The distribution in California is shown in map 38.

SEASONAL DATA: Adults have been taken in June and July.

**SUBGENUS PSAMMITIS MENGE
(=SPIRACME MENGE)**

TYPE: *Thomisus sabulosus* Hahn, 1831.

Frontal row comprising three principal spiniforms on each side. Male palpus: Embolus with an apical embolar sclerite; distal crescent, MBA, ABA, and apicotegular process absent. Tutacular apophysis of *utahensis* type; distal tooth of RTA reduced. Receptaculum: Spermatheca lacking numerous transverse seams (based on *knowltoni*).

Only one species of *Psammitis* is known from California, *Xysticus knowltoni* (*sabulosus* series). A second species of *Psammitis*, *X. labradorensis* Keyserling (*labradorensis* series), is cited from Los Angeles in Gertsch, 1939; this is probably a spurious record.

***Xysticus (Psammitis) knowltoni* Gertsch**

Xysticus knowltoni GERTSCH, 1939, p. 399, figs. 244, 245.

Xysticus (Spiracme) knowltoni: GERTSCH, 1953, p. 452.

FEMALE: (Based on one specimen). Length 5.0 mm.

Mesodiscus dark brown, metadiscus with dark variegations; posterior declivity completely dark; allatal stripes converging cau-



MAP 38. Distributions of *Xysticus knowltoni* Gertsch, *X. pearcei*, new species, and *X. benefactor* Keyserling.

dally along their entire length; most primary discal setae clavate and short, only P1 longer than ALE diameter; secondary setae of disc clavate, prominent; S5 short and spiniform, subequal to S6; T2, T3, and T4, as well as most other primary discals, not distinct from secondary setae. Tibia I, 0-3-1; basitarsus I, 1-3-2 and 1-2-2.

Epigynum (fig. 248): Median septum broad, situated somewhat above level of epigynal rim; lateral atria distinct, deep.

Receptaculum (fig. 249): Bursa copulatrix very short; spermatheca subdivided into nearly equal proximal and distal portions, proximal portion darker and covered by numerous flat tubercles of spermathecal organ, distal portion pale and smooth.

MALE: (Based on one specimen). Length 3.5 mm.

Mesodiscus and metadiscus with dark variegations; posterior declivity of carapace generally dark; allatal stripes converging caudally along their entire length; primary carapace setae subequal to or shorter than ALE diameter, blunt to clavate; secondary discal setae subclavate to clavate; P2 directed laterad; S5 short, subspiniform or spiniform, somewhat weaker than S6; T2, T3, and T4 not readily distinct from secondary discal setae.

Palpus (fig. 247): Pars pendula with a distally directed semicircular fold near base of apical embolar sclerite; embolar sclerite otherwise similar to that of *utahensis*, with numerous minute tubercles.

TYPE: Holotype, male, Vernon, Utah, May 2, 1936, G. F. Knowlton, in the American Museum of Natural History.

DISTRIBUTION: California (map 38); Utah.

ECOLOGY: Most specimens of this infrequently collected species have been taken on vegetation, but some have been collected in leaf detritus.

SEASONAL DATA: Mature forms occur in May and June.

GENUS *CORIARACHNE* THORELL

Coriarachne THORELL, 1870, p. 186. SIMON, 1895, p. 1015. GERTSCH, 1939, p. 349; 1953, p. 420.

Platyxysticus GERTSCH, 1932, p. 1. Synonymy with *Coriarachne* by Gertsch, 1939.

TYPES: Of *Coriarachne*, *Thomisus depressus* C. L. Koch, 1837. Of *Platyxysticus*, *Coriarachne versicolor* Keyserling, 1880.

Diagnosis essentially that of apophysate *Xysticus* with tutaculum of *utahensis* type, except carapace markedly depressed (with following resulting features: clypeus low, anterior row of eyes nearly straight, cephalic sutures deep, discus strongly narrowed caudad, and posterior declivity poorly defined) and spermatheca with numerous transverse seams.

Coriarachne comprises two groups, *depressus* and *versicolor*. The *versicolor* group is equivalent to that of Gertsch (1953) and the *depressus* group to the *brunneipes* group of Gertsch (1953).

KEYS TO THE SPECIES OF *Coriarachne* IN CALIFORNIA

Males

Apical embolar sclerite spiralliform, smoothly sculptured (fig. 253) *brunneipes*
Apical embolar sclerite only slightly curved, invested with minute tubercles *utahensis*

Females

Carapace setae setiform. Epigynum (fig. 254) anemic white *brunneipes*
Carapace setae blunt to clavate. Epigynum (fig. 251) yellowish *utahensis*

Versicolor GROUP

Carapace setae blunt to clavate. Male palpus: Apical embolar sclerite only slightly curved. Distal tooth of RTA well developed, originating on inner margin of apophysis.

Coriarachne utahensis (Gertsch)

Platyxysticus utahensis GERTSCH, 1932, pp. 5-7, fig. 2.

Coriarachne utahensis: GERTSCH, 1939, p. 408; 1953, p. 460.

FEMALE: Length very variable, averaging about 8.0 mm.

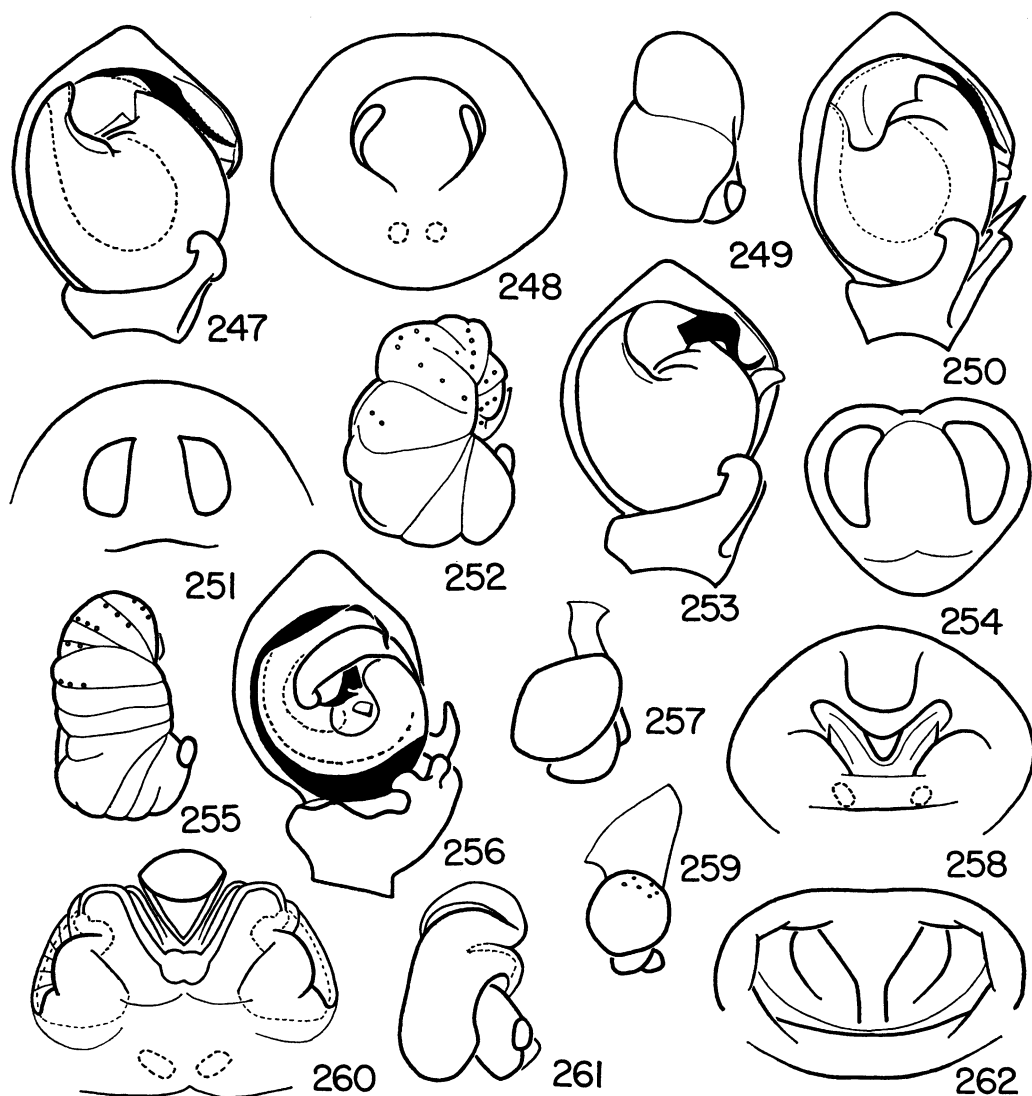
Carapace usually extensively marked with white variegations. Tibia I typically 0-4-1 or 0-5-1; basitarsus I, 2-3-2 or 2-4-2.

Epigynum (fig. 251): Not sharply demarcated from surrounding abdominal areas as in *brunneipes*.

Receptaculum (fig. 252): Proximal portion of spermatheca recurved.

MALE: Average length about 6.0 mm.

Tibia I typically 0-5-1; basitarsus I, 2-3-2.



FIGS. 247–249. *Xysticus knowltoni* Gertsch. 247. Male palpus, ventral view. 248. Epigynum. 249. Receptaculum, dorsal view.

FIGS. 250–252. *Coriarachne utahensis* (Gertsch). 250. Male palpus, ventral view. 251. Epigynum. 252. Receptaculum, dorsal view.

FIGS. 253–255. *Coriarachne brunneipes* (Banks). 253. Male palpus, ventral view. 254. Epigynum. 255. Receptaculum, dorsal view.

FIGS. 256–258. *Ozyptila nevadensis* Keyserling. 256. Male palpus, ventral view. 257. Receptaculum, dorsal view. 258. Epigynum.

FIGS. 259–260. *Ozyptila inglesi*, new species. 259. Receptaculum, dorsal view. 260. Epigynum.

FIGS. 261, 262. *Ozyptila yosemitica*, new species. 261. Receptaculum, dorsal view. 262. Epigynum.

Palpus (fig. 250): Apical embolar sclerite apically with minute tubercles.

TYPES: Holotype, male, and allotype, female, from Salt Lake City, Utah, July 2, 1931, in the American Museum of Natural History.

DISTRIBUTION: "Entire western United States from Rocky Mountains to Pacific Coast, north into Alaska, south into western Mexico, eastward in Canada to Nova Scotia and adjacent states of Maine, New York, and Minnesota" (Gertsch, 1953). The distribution in California is shown in map 39.

ECOLOGY: *Utahensis* has been collected personally in the San Diegan District almost exclusively under dead bark, only a few young immatures being taken on nearby vegetation. Gertsch (1932) lists other habitats as under rocks and in natural debris.

SEASONAL DATA: Males have been taken from May through October; females, virtually throughout the year. Of one March collection (consisting of several mature females, penultimate males, and penultimate females) all the immatures molted to maturity in that month or shortly afterward.

Depressus GROUP

Carapace setae setiform. Male palpus: Apical embolar sclerite spiralliform. Distal tooth of RTA small, not readily visible ventrally, or not apparent.

Coriarachne brunneipes Banks

Coriarachne brunneipes BANKS, 1893, p. 133. GERTSCH, 1939, p. 410; 1953, p. 461.

FEMALE: Average length about 9.0 mm.

Carapace largely dark brown, with only a few white variegations. Tibia I, 0-5-1; basitarsus I, 0(2)-3-3, 0(2)-4-2.

Epigynum (fig. 254): White, sharply delimited from surrounding abdominal region.

Receptaculum (fig. 255): Spermatheca relatively more slender and proximal portion more erect than those of *utahensis* (cf. fig. 252).

MALE: (Based on one Vancouverian specimen). Length 5.0 mm.

Tibia I, 0-6-1; basitarsus I, 1-3-2.

Palpus (fig. 253): Apical embolar sclerite without minute tubercles. Distal tooth of RTA not apparent.

TYPES: Syntypes, male, female, Olympia,

Washington, in the Museum of Comparative Zoölogy.

DISTRIBUTION: "Western United States and Canada from Colorado and Arizona north into Montana, British Columbia, and Alaska" (Gertsch, 1953). The distribution in California is shown in map 39.

SEASONAL DATA: Adults have been taken in May and June.

GENUS *OZYPTILA* SIMON

Ozyptila SIMON, 1864, p. 439. GERTSCH, 1939, p. 340.

Ozyptila THORELL, 1869, p. 14. SIMON, 1895, p. 1035. GERTSCH, 1953, p. 463. Invalid emendation of *Ozyptila*.

TYPE: *Thomisus brevipes* Hahn, 1826.

Clypeus vertical, not carinate, lateral eyes situated on low discrete tubercles; ALE larger than AME; carapace setae setiform, blunt, or clavate; setae A1 and A2 reduced, subequal in size, recumbent; X-seta present, though not prominent; T5 not a principal element of the setal vestiture of the discus. Femora with prodorsal spiniforms; tibiae I, II, 0-2-0 (but proventroapical spiniforms in some cases weakly developed); basitarsi I, II with or without prolateral spiniforms, otherwise spiniform formula X-2-1; legs I and II of male with well-developed spiniforms. Male palpus: Embolus usually distinctive, truncus irregular in width rather than evenly tapering apicad; tegulum without apophyses (subgenus *Modysticus*) or with apophyses (subgenus *Ozyptila*); circumtegular ridge not developed, basal tegular ridge present, variously reduced, in some cases not apparent. Tutacular apophysis weakly developed (subgenus *Modysticus*) or lacking (subgenus *Ozyptila*); ITA apparently developed as a small independent lobe (subgenus *Modysticus*) or associated with VTA (subgenus *Ozyptila*); RTA broad and short but distal tooth long, often elaborately developed, dorsal in origin. Receptaculum: Bursa copulatrix and spermatheca usually distinctly delimited from each other.

KEY TO THE SPECIES OF *Ozyptila* IN CALIFORNIA (FEMALES ONLY)

1. Epigynal guide pocket present, anterior in position 2
- Guide pocket absent 3
- 2(1). Intromittent orifice distinct (usually oc-



MAP 39. Distributions of *Coriarachne utahensis* (Gertsch) and *C. brunneipes* Banks.

cluded with tough brown exudate)
funnel-like, situated at lateral margin of
epigynum (fig. 260) *inglesi*

Intromittent orifice indistinct, slitlike, situ-
ated mesiad of lateral margin (fig. 258)

- *nevadensis*
3(1). Pars cephalica relatively narrow, width in-
dex 3.7 (based on one specimen); carapace
setae C1 and C4 blunt, seta C3 subclavate
. *schusteri*
Pars cephalica width typical for subgenus,
index 4.8–5.0; C3 clavate, similar in form
to other spiniforms of frontal row . . .
. *yosemitica*

Ozyptila (Ozyptila) inglesi, new species

FEMALE: Average length about 3.5–4.0
mm.

Pars cephalica width index 4.8–5.3; allatum
with a more or less distinct, pale, median
stripe; spiniforms of frontal row all blunt;
dorsum of abdomen pale, with transverse
dark markings.

Epigynum (fig. 260): Guide pocket pres-
ent; median septum not distinct; intromittent
orifice distinct, funnel-shaped, situated at
lateral margin of epigynum.

Receptaculum (fig. 259): Bursa copulatrix
and spermatheca distinctly delimited from
each other; bursa copulatrix narrowing dis-
tad; spermatheca anteriorly with several
small flat tubercles of spermathecal organ.

MALE: Unknown.

TYPE: Holotype, female, Huntington Lake,
7000 feet, Fresno County, California, Sep-
tember 27, 1957, L. G. Ingles, in the Ameri-
can Museum of Natural History.

DISTRIBUTION: Known only from Califor-
nia (map 40).

REMARKS: *Inglesi* is close to *Ozyptila paci-
fica* Banks, 1895, from Washington but
differs from *pacifica* in having a larger epigy-
num, broader guide pocket, more widely
spaced intromittent orifices, larger bursa
copulatrix, and smaller spermatheca.

Ozyptila (Ozyptila) nevadensis Keyserling

Oxyptila nevadensis KEYSERLING, 1880, pp. 50–
51, pl. 1, fig. 25.

Oxyptila (Oxyptila) nevadensis: GERTSCH, 1953,
pp. 467–468.

Oxyptila nevadensis: GERTSCH, 1939, pp. 347–
348.

FEMALE: Length 3.5 mm.

Pars cephalica width index 5.0; allatum

lacking pale median stripe; spiniforms of
frontal row all clavate. Dorsum of abdomen
pale, with or without dark variegations.

Epigynum (fig. 258): Guide pocket and
median septum present; intromittent orifice
obscure, formed by intersection of two slits
forming a Y, the stem directed caudo-
mesiad.

Receptaculum (fig. 257): Bursa copulatrix
and spermatheca clearly delimited from each
other; bursa copulatrix similar in diameter
throughout; spermatheca lacking tubercles of
spermathecal organ.

MALE: Length 3.0 mm.

Palpus as shown in figure 244.

TYPE: Holotype, female, Nevada, in Simon
collection, Museum National d'Histoire Na-
turelle, Paris.

DISTRIBUTION: "Western United States
from Rocky Mountains (New Mexico and
Colorado) into California and Oregon; oc-
casional in the east (Illinois and North Caro-
lina)" (Gertsch, 1953). The distribution in
California is shown in map 40.

SEASONAL DATA: Females have been taken
in March.

Ozyptila (Ozyptila) yosemitica, new species

FEMALE: Average length about 3.5 mm.

Pars cephalica width index 4.8–5.0; allatum
lacking pale median stripe; spiniforms of
frontal row all clavate. Dorsum of abdomen
dark, with some pale variegations.

Epigynum (fig. 262): Guide pocket absent;
median septum present, flat; intromittent
orifice long, slitlike, roughly U-shaped, mesial
segment readily visible in atrium, but lateral
portions hidden beneath anterior and lateral
flaps bordering atrium.

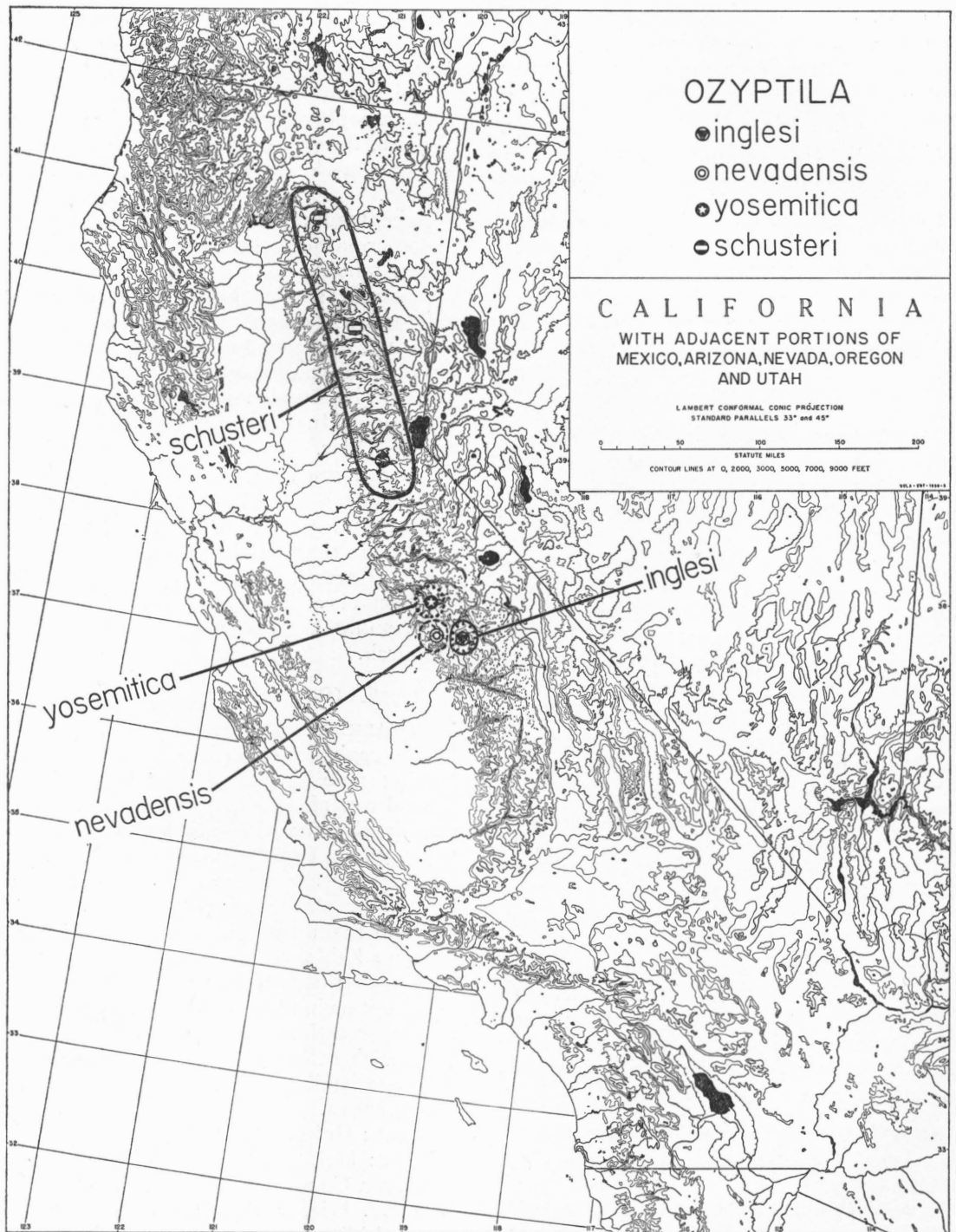
Receptaculum (fig. 261): Bursa copulatrix
and spermatheca not distinctly delimited
from each other; spermatheca broadly con-
volved distally, lacking tubercles of sperma-
thecal organ.

MALE: Unknown.

TYPE: Holotype, female, Wawona Camp,
Mariposa County, California, September 17,
1941, W. Ivie, in the American Museum of
Natural History.

DISTRIBUTION: Known only from Califor-
nia (map 40).

SEASONAL DATA: Mature females have
been collected in March and September;



MAP 40. Distributions of *Ozyptila inglesi*, new species, *O. nevadensis* Keyserling, *O. yosemitica*, new species, and *O. schusteri*, new species.

penultimate males, in September.

REMARKS: *Ozyptila yosemitica* apparently can be distinguished from other species of Nearctic *Ozyptila*, except *schusteri* (see below), by the absence of an epigynal guide pocket and by the low, flat, median septum.

***Ozyptila (Ozyptila) schusteri*, new species**

FEMALE: (Based on holotype). Length 3.7 mm.

Pars cephalica width index 3.7, narrower than usual for the genus; allatum with a broad, somewhat indistinct, pale stripe; spiniforms of frontal row either blunt (C1, C4) or subclavate (C3). Dorsum of abdomen moderately dark, with black transverse mark-

ings which tend to fuse longitudinally.

Epigynum: Similar to that of *yosemitica* but structure less well defined.

Receptaculum: Not examined.

MALE: Unknown.

TYPE: Holotype, female, Riverton, El Dorado County, California, February 22, 1958, R. O. Schuster, in the American Museum of Natural History.

DISTRIBUTION: Known only from California (map 40).

REMARKS: *Ozyptila schusteri* can be distinguished from other Californian species of *Ozyptila* (even in the immature stages) by the narrow pars cephalica. In this respect *schusteri* approaches *O. hardyi* Gertsch.

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The morphological terms and abbreviations of this Index include only those contained in the taxonomic treatment.

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